NOAA SCIENTIFIC PUBLICATIONS REPORT

FEBRUARY 26, 2016

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[Fishery-induced evolution provides insights into adaptive responses of marine species to climate change](#)
Frontiers in Ecology and the Environment (7.441)

[Multi-decadal decline of reef fish abundance and species richness in the southeast United States assessed by standardized trap catches](#)
Marine Biology (2.391)

[Coupled downscaled climate models and ecophysiological metrics forecast habitat compression for an endangered estuarine fish](#)
PLOS ONE (3.534)

[Critical assessment and ramifications of a purported marine trophic cascade](#)
Nature-Scientific Reports (5.578)

[Ocean-wide tracking of pelagic sharks reveals extent of overlap with longline fishing hotspots](#)
Proceedings of the National Academy of Sciences (9.674)

[A qualitative analysis of NWS forecasters' use of phased-array radar data during severe Hail and wind event](#)
Weather and Forecasting (1.606)

[Methane emissions from the 2015 Aliso Canyon blowout in Los Angeles, CA](#)
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[Severe coal tar sealcoat runoff toxicity to fish is reversed by bioretention infiltration](#)
Environmental Science & Technology (5.481)

Advances in tropical cyclone intensity forecasts

Marina Technology Society Journal (0.434)

Continued emissions of carbon tetrachloride from the U.S. nearly two decades after its phase-out for dispersive uses

Proceedings of the National Academy of Sciences (9.674)

The design and performance of an automated observer deployment system for the Northeastern United States groundfish fishery

Fisheries Research (1.903)

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NOS Publications

Improved seagrass mapping using linear spectral unmixing of aerial photographs

Estuarine, Coastal and Shelf Science (2.057)

A hierarchical approach to defining marine heatwaves

Progress in Oceanography (3.025)

NMFS Publications

Offshore habitat preference of overwintering juvenile and adult black sea bass, *Centropristis striata*, and the relationship to year-class success

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Increasing the accessibility of acoustic data through global access and imagery

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Effects of temperature and salinity on growth of *Alexandrium* isolates from the Salish Sea

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ICES Journal of Marine Science (2.377)

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Marine Mammal Science (1.936)

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Ecology (4.656)

Fine scale genetic population structure of loggerhead turtles in the Northwest Pacific

Endangered Species Research (2.259)

Modeling food choice in suspension-feeding bivalves

Marine Biology (2.391)

Confirmation of stormwater bioretention treatment effectiveness using molecular indicators of cardiovascular toxicity in developing fish

Environmental Science & Technology (5.330)

Integrating DNA barcoding of fish eggs into ichthyoplankton monitoring programs

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Tracking growth and survival of rescued boulder corals

Restoration Ecology (1.838)

Understanding vulnerability in Alaska fishing communities: A validation methodology for rapid assessment of indices related to well-being

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Fetal distress and in utero pneumonia in perinatal dolphins during the Northern Gulf of Mexico unusual mortality event

Diseases of Aquatic Organism (1.752)

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[Conservation of native Pacific trout diversity in western North America](#)
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Fisheries Oceanography (2.543)

[A state-space approach to incorporating environmental effects on recruitment in an age-structured assessment model with an application to Southern New England yellowtail flounder](#)
Canadian Journal of Fisheries and Aquatic Sciences (2.276)

[Shifts of sensory modalities in early life history stage estuarine fishes (Sciaenidae) from the Chesapeake Bay using X-ray micro computed tomography](#)
Environmental Biology of Fishes (1.356)

[Risk analysis of plausible incidental exploitation rates for Pacific Sleeper Sharks *Somniosus pacificus*: a data-poor species in the Gulf of Alaska](#)
North American Journal of Fisheries Management (1.110)

[Estuarine residency and migration of Southern Flounder inferred from conventional tag returns at multiple spatial scales](#)
Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science (1.592)

[Applying portfolio management to implement ecosystem-based fishery management](#)
North American Journal of Fisheries Management (0.954)

A safer catch? The effects of catch share management on fishing safety

Proceedings of the National Academy of Sciences (9.674)

Round-the-Coast: Snapshots of estuarine climate change effects

Fisheries Magazine (1.25)

Polychlorinated biphenyls and organochlorine pesticides as intrinsic tracer tags of foraging grounds of bluefin tuna in the Northwest Atlantic Ocean

Marine Pollution Bulletin (2.991)

NWS Publications

Observations and operational considerations of the 4 June 2013 Chaff Event in northern Alabama

Journal of Operational Meteorology (1.702)

OAR Publications

Net community production and calcification from seven years of NOAA Station Papa Mooring measurements

Global Biogeochemical Cycles (3.965)

Circulation and water renewal of Florida Bay, USA

Bulletin of Marine Science (1.503)

Fifteen years of ocean observations with the global Argo array

Nature Climate Change (14.547)

Paper identifies variability of preferred environmental conditions for Atlantic Bluefin tuna larvae in the Gulf of Mexico

Fisheries Oceanography (2.542)

Cross Line Office Publications

Decadal comparison of a diminishing coral community: a case study using demographics to advance inferences of community status

PeerJ (2.112)

[Epibenthic community assessments indicate high spatial and temporal variability among continental shelf hard bottom sites in a marine transition zone](#)

Regional Studies in Marine Science

[Multi-Radar Multi-Sensor (MRMS) severe weather and aviation products: Initial operating capabilities](#)

Bulletin of the American Meteorological Society (11.57)

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

[Chapter 35. Extent of assessment of marine biological diversity](#)

First Global Integrated Marine Assessment, World Ocean Assessment I.

[Chapter 36F. Open Ocean Deep Sea](#)

First Global Integrated Marine Assessment, World Ocean Assessment I.

[Chapter 36G. Arctic Ocean](#)

First Global Integrated Marine Assessment, World Ocean Assessment I

[Chapter 36H. Southern Ocean](#)

First Global Integrated Marine Assessment, World Ocean Assessment I.

[Chapter 41. Tunas and Billfishes](#)

First Global Integrated Marine Assessment, World Ocean Assessment I.

[Chapter 51. Biological communities on seamounts and other submarine features potentially threatened by disturbance](#)

First Global Integrated Marine Assessment, World Ocean Assessment I.

HIGHLIGHTED ARTICLES

Fishery-induced evolution provides insights into adaptive responses of marine species to climate change
Frontiers in Ecology and the Environment (7.441)
R. S. Waples (NMFS/NWFSC) and A. Audzijonyte
- Climate change (esp warmer water and less dissolved oxygen) will increase adult mortality and create pressure for marine species to evolve 'faster' life histories (earlier maturation at a smaller size, with shorter lifespan)
- Increased mortality from fishing has already caused similar responses in many marine fish species, such as cod, hake, and plaice
- Insights gained from the study of fishery-induced evolution can help managers plan for broader impacts to many more marine species as a result of climate change.

Climate change challenges marine species with seawater that is warmer, with less oxygen and lower pH. Most climate-change studies have focused on acclimation or shifts in distribution; relatively little is known about the capacity of marine species to respond through evolution. We propose that important insights can be gained from recent studies of fishery-induced evolution (FIE), which show that increased adult mortality from fishing leads to rapid changes in growth and reproduction schedules. These changes consistently involve evolution of 'faster' life histories: earlier maturation at smaller size, and shorter lifespan. In the ocean, coupled effects of higher temperatures and reduced oxygen also differentially affect larger/older individuals, so expected evolutionary consequences of climate change are qualitatively similar to those of FIE. This general pattern will apply to large numbers of marine species and has important implications for conservation and management.
Acceptance date: 1 January 2016

Multi-decadal decline of reef fish abundance and species richness in the southeast United States assessed by standardized trap catches
Marine Biology (2.391)
N. M. Bacheler (NMFS/SEFSC) and T. Smart

- Non-targeted reef fish species along the southeast United States Atlantic coast have declined more drastically than fishery-targeted species using both raw and standardization modeling approaches.
- The abundance of non-targeted reef fish species has likely been influenced invasive species and/or climate variability/change.

Reef fish species naturally fluctuate in abundance over various temporal and spatial scales, but recent broad-scale declines in abundance have been observed worldwide and attributed to various anthropogenic influences. We used 25 years of fishery-independent trap data (N = 11,237 trap hauls) to examine the spatial and temporal variability in temperate reef fish abundance along the southeast coast of the United States, a relatively understudied region with many economically important reef fish species. Overall, 441,298 individuals from 118 species were caught in the trap survey. Number of species and total number of individuals caught in the trap survey declined over the 25 years, but when separated, non-targeted fish species declined more than fishery-targeted species. For instance, traps caught a median of 18 non-targeted individuals and a median of 2 – 3 non-targeted reef-fish species in the early 1990s, but by the 2010s, traps caught a median of fewer than 3 non-targeted individuals and a median of 1 non-target species. Using generalized additive models, we found that the catch of fishery-targeted and non-targeted species was positively related to bottom water temperature, while depth influenced non-targeted and fishery-targeted species in opposite ways. The substantial and consistent decline of non-targeted fish species suggests that more research and management attention should be given to these often ignored species. These results suggest that the temperate reef fish community in the southeast United States is influenced by more than just fishing, perhaps including invasive species (e.g., lionfish *Pterois volitans*), decadal-scale environmental variability, or climate change.

Acceptance date: 23 October 2015

Available online: http://link.springer.com/article/10.1007/s00227-015-2774-x

Coupled downscaled climate models and ecophysiological metrics forecast habitat compression for an endangered estuarine fish

PLoS ONE (3.534)

L. R. Brown, **L. M. Komoroske (NMFS/SWFSC)**, R. W. Wagner , T. Morgan-King, J. T. May, R. E. Connon, and N. A. Fangue

- This collaborative paper reports future habitat suitability for endangered delta smelt at finer scales that are relevant to restoration projects and other management decisions.
- Using life-stage specific physiological data and downscaled climate models, the authors identify areas that are likely to be not suitable and sub-optimal for this species (and other similarly thermally sensitive native fish).
- Results indicate likely contraction of thermally suitable habitat for this endemic species.

Climate change is driving rapid changes in environmental conditions and affecting population and species' persistence across spatial and temporal scales. Integrating climate change assessments into biological resource management, such as conserving endangered species, is a substantial challenge, partly due to a mismatch between global climate forecasts and local or regional conservation planning. Here, we demonstrate how outputs of global climate change models can be downscaled to the watershed scale, and then coupled with ecophysiological metrics to assess climate change effects on organisms of conservation concern. We employed models to estimate future water temperatures (2010-2099) under several climate change scenarios within the large heterogeneous San Francisco Estuary. We then assessed the warming effects on the endangered, endemic Delta Smelt, *Hypomesus transpacificus*, by integrating localized projected water temperatures with thermal sensitivity metrics (tolerance, spawning and maturation windows, and sublethal stress thresholds) across life stages. Lethal temperatures occurred under several scenarios, but sublethal effects resulting from chronic stressful temperatures were more common across the estuary (median >60 days above threshold for >50% locations by the end of the century). Behavioral avoidance of such stressful temperatures would make a large portion of the potential range of Delta Smelt unavailable during the summer and fall. Since Delta Smelt are not likely to migrate to other estuaries, these changes are likely to result in substantial habitat compression. Additionally, the Delta Smelt maturation window was shortened by 18-85 days, revealing cumulative effects of stressful summer and fall temperatures with early initiation of spring spawning that may negatively impact fitness. Our findings highlight the value of integrating sublethal thresholds, life history, and in

situ thermal heterogeneity into global change impact assessments. As downscaled climate models are becoming widely available, we conclude that similar assessments at management-relevant scales will improve the scientific basis for resource management decisions.

Critical assessment and ramifications of a purported marine trophic cascade
Nature-Scientific Reports (5.578)

R. D. Grubbs, **J. K. Carlson (NMFS/SEFSC)**, J. G. Romine, **T.H. Curtis (NMFS/GARFO)**, **W. D. McElroy(NMFS/NEFSC)**, **C. T. McCandless (NMFS/NEFSC)**, C. F. Cotton, and J. A. Musick

- New analyses indicate there is little support for the hypothesis of a purported shark-mediated trophic cascade in the coastal mid-Atlantic that a great number of papers have cited (Myers et al. 2007 in *Science*).
- Temporal and dietary evidence is lacking to support the conclusion that higher cownose ray abundance led to the collapse of commercial bivalve populations as bivalve stocks had undergone dramatic declines due to other causes more than a decade before the reported increases in cownose rays occurred.
- Currently there is an unregulated fishery for cownose rays. This fishery often justifies its existence based upon the idea that cownose ray populations need to be controlled, and this fishery may be detrimental to this population of slow-growing elasmobranchs with limited intrinsic growth rate and rebound potential.

When identifying potential trophic cascades, it is important to clearly establish the trophic linkages between predators and prey with respect to temporal abundance, demographics, distribution, and diet.   In the northwest Atlantic Ocean, the depletion of large coastal sharks was thought to trigger a trophic cascade. Predation release resulted in increased cownose ray abundance, which then caused increased predation and subsequent collapse of commercial bivalve stocks. These claims were used to justify the development of a predator-control fishery for cownose rays, the "Save the Bay, Eat a Ray" fishery, to reduce predation on

commercial bivalves. A reexamination of data suggests declines in large coastal sharks did not coincide with purported rapid increases in cownose ray abundance. Likewise, the increase in cownose ray abundance did not coincide with declines in commercial bivalves.   The lack of temporal correlations coupled with diet data for large coastal sharks and cownose rays suggests the purported trophic cascade is lacking the empirical linkages required of a trophic cascade. Furthermore, the life history parameters of cownose rays suggests they have low reproductive potential and their populations are incapable of rapid increases. Hypothesized trophic cascades should be closely scrutinized as spurious conclusions may negatively influence conservation and management decisions.

Publication date: 15 February 2016

Available online: http://www.nature.com/articles/srep20970

Ocean-wide tracking of pelagic sharks reveals extent of overlap with longline fishing hotspots

Proceedings of the National Academy of Sciences (9.674)

N. Queiroza, N. E. Humphries, G. Mucientes, N. Hammerschlag, F. P. Lima, **K. L. Scales (NMFS/SWFSC)**, P. I. Miller, L. L. Sousaa, R. Seabra, and D. W. Sims

- Used tracking and satellite environmental data to identify shark and longline 'hotspots'
- Some longline fleets showed a high degree of overlap with shark and pelagic longline 'hotspots'

Overfishing is arguably the greatest ecological threat facing the oceans, yet catches of many highly migratory fishes including oceanic sharks remain largely unregulated with poor monitoring and data reporting. Oceanic shark conservation is hampered by basic knowledge gaps about where sharks aggregate across population ranges and precisely where they overlap with fishers. Using satellite tracking data from six shark species across the North Atlantic, we show that pelagic sharks occupy predictable habitat hotspots of high space use. Movement modeling showed sharks preferred habitats characterized by strong sea surface-temperature gradients (fronts) over other available habitats. However, simultaneous Global Positioning System (GPS) tracking of the entire Spanish and Portuguese longline-vessel fishing fleets show an 80% overlap of fished areas with hotspots, potentially increasing shark susceptibility to fishing exploitation. Regions

of high overlap between oceanic tagged sharks and longliners included the North Atlantic Current/Labrador Current convergence zone and the Mid-Atlantic Ridge southwest of the Azores. In these main regions, and sub-areas within them, shark/vessel co-occurrence was spatially and temporally persistent between years, highlighting how broadly the fishing exploitation efficiently "tracks" oceanic sharks within their space-use hotspots year-round. Given this intense focus of longliners on shark hotspots, our study argues the need for international catch limits for pelagic sharks and identifies a future role of combining fine-scale fish and vessel telemetry to inform the ocean-scale management of fisheries.
Published: 26 January 2016
Available online:
http://www.pnas.org/content/early/2016/01/20/1510090113.full.pdf?sid=74429d58-8657-4576-914a-e9dfb8a22786

A qualitative analysis of NWS forecasters' use of phased-array radar data during severe Hail and wind event
Weather and Forecasting (1.606)
K. A. Bowden and **P. L. Heinselman (OAR/NSSL)**
- This paper summarizes qualitative findings from the 2013 Phased Array Radar Innovative Sensing Experiment.
- It builds on results presented in the published Impacts of Phased-Array Radar Data on Forecaster Performance during Severe Hail and Wind Events.
- This paper demonstrates efforts that are being made to learn about the forecaster warning decision process through the use of social science techniques.

Forecasters using 1-minute radar updates perceived significantly more information than forecasters using 5-minute radar updates and demonstrated improved projections of storm activity in the hail and wind cases worked, owing to earlier perception of severe weather precursor signatures and the ability to more easily observe strengthening and diminishing trends in storms. Such improvements in situational awareness from the use of 1-minute radar updates resulted in superior severe warning lead times and supported correct rejections of unverified threats.
Expected Publication date: February 2016

Methane emissions from the 2015 Aliso Canyon blowout in Los Angeles, CA.
Science (31.48)
S. Conley, G. Franco, I. Faloona, D. R. Blake, J. Pieschl, and **T. B. Ryerson (OAR/ESRL/CSD)**

- The Aliso Canyon natural gas well blowout released over 100,000 tons of the greenhouse gas methane
- Analysis found that at its peak, the blowout doubled the rate of methane emissions from the entire Los Angeles Basin and temporarily created the largest known human-caused point source of methane in the United States.
- Total emissions during the 112-day event were equal to one-quarter of the annual methane pollution from all other sources in the Los Angeles Basin combined. The disaster's impact on climate will be equivalent to the annual greenhouse gas emissions from over half a million passenger cars.
- The disaster will substantially impact California's ability to meet state greenhouse gas emission targets for the year

Single-point failures of the natural gas infrastructure can hamper deliberate methane emission control strategies designed to mitigate climate change. The 23 October 2015 blowout of a well connected to the Aliso Canyon underground storage facility in California resulted in a massive release of natural gas. Analysis of methane (CH_4) and ethane (C_2H_6) data from dozens of plume transects from 13 research aircraft flights between 7 Nov 2015 and 13 Feb 2016 shows atmospheric leak rates of up to 60 metric tonnes of CH_4 and 4.5 metric tonnes of C_2H_6 per hour. At its peak this blowout effectively doubled the CH_4 emission rate of the entire Los Angeles Basin, and in total released 97,100 metric tonnes of methane to the atmosphere.
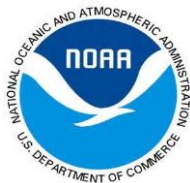Publication date: 25 February 2016
Available online:
http://science.sciencemag.org/content/early/2016/02/25/science.aaf2348

Severe coal tar sealcoat runoff toxicity to fish is reversed by bioretention infiltration
Environmental Science & Technology (5.481)
J. K. McIntyre, **B. F. Anulacion**, J. W. Davis, **R. C. Edmunds, J. P. Incardona,** J. D. Stark, and **N. L. Scholz (NMFS/NWFSC)**

- Coal tar-based sealcoats are frequently used on asphalt surfaces in the central and eastern U.S.
- Runoff from coal tar-based sealcoat coated surfaces is enriched in petroleum-derived polycyclic aromatic hydrocarbons (PAHs) and is highly toxic to fish over a timespan of months
- In watersheds where coal tar-based sealcoats are widely used, stormwater runoff may be a particular hazard for fisheries resources (e.g., rivers, estuaries, and the Great Lakes)
- Infiltrating stormwater through soil columns reversed nearly all of the observable toxicity to juvenile salmon and zebrafish
- If bioinfiltration can treat a relatively concentrated source of PAHs, it may also be useful for more conventional urban non-point source pollution throughout the US

Coal tar sealcoat applied to asphalt surfaces throughout North America is rich in petroleum-derived hydrocarbons, including polycyclic aromatic hydrocarbons (PAHs). Released by leaching and surface wear, PAHs in coal tar sealcoats increase contamination of nearby water bodies, potentially affecting the resiliency of aquatic communities. Despite this, relatively little is known about the aquatic toxicology of runoff from coal tar sealcoated surfaces. We applied a coal tar sealcoat to existing asphalt and tested the acute lethal and sublethal toxicity of runoff at time intervals of 2 h, 7 d, 14 d, and 7 months post-application. Lethal and sublethal toxicity was evident, with mortality observed in juvenile coho salmon (*Onchorhynchus kisutch*) and embryo-larval zebrafish (*Danio rerio*) for 75% and 25% of events, respectively. Sealcoat runoff produced acute cardiovascular toxicity in surviving zebrafish embryos. In contrast, runoff collected from an adjacent asphalt-only plot produced no acute toxicity. Furthermore, we treated runoff using a green stormwater infrastructure approach - infiltration through experimental bioretention cells containing a mixture of compost and sand. Bioretention treatment reduced PAH concentrations 10-fold, but not to control levels, as indicated by persistent induction of a molecular marker of aromatic hydrocarbon exposure (cytochrome P450; *cyp1a*) in zebrafish embryos exposed to treated runoff. In contrast, a molecular marker of cardiac stress (B-type natriuretic peptide; *nppb*) was significantly induced in zebrafish exposed to coal tar sealcoat runoff, but not in most runoff treated with

bioretention. Elimination of visible cardiotoxicity corresponded with reduced perturbation of molecular cardiotoxicity indicators.
Acceptance date: 10 December 2015
Expected Publication date: Winter 2016
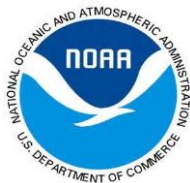

Advances in tropical cyclone intensity forecasts
Marina Technology Society Journal (0.434)
R. Atlas (OAR/AOML), V. Tallapragada (NWS/EMC), and **S. Gopalakrishnan (OAR/AOML)**
- Under the Hurricane Forecast Improvement Project (HFIP), there have been significant improvements to NOAA's operational hurricane prediction model resulting in increased accuracy in the numerical guidance for tropical cyclone intensity predictions.
- This paper documents many of the improvements accomplished over the last 5 years, as well as some future research directions. In particular, for the first time, a very-high resolution (3 km) deterministic numerical weather prediction model, known as the Hurricane Weather Research and Forecast (HWRF) modeling system, has shown comparable, and at times, superior, tropical cyclone intensity forecast skill compared to the best performing statistical models.
- The improvements to operational hurricane models reduce warning and evacuation areas, saving lives and resources.

A key for improving forecasts of genesis, storm size near landfall, rainfall, and for extending lead times beyond 5 days lies in the creation of a basin-scale model (eventually covering the entire globe) with multiple moving nests at 1-3 km resolution covering the storms in the basin. Additional efforts in pursuit by NOAA to improve model performance include development and deployment of new observing systems on hurricane hunter aircraft and conducting Observing System Simulation Experiments to evaluate sampling strategies for both reconnaissance aircraft and unmanned aerial systems as well as to evaluate the potential impact of new space-based observing systems.
Publication date: December 2015

Continued emissions of carbon tetrachloride from the U.S. nearly two decades after its phase-out for dispersive uses

Proceedings of the National Academy of Sciences (9.674)

L. Hu (OAR/ESRL/GMD & CIRES), S. A. Montzka (OAR/ESRL/GMD), B. R. Miller (OAR/ESRL/GMD & CIRES), A. E. Andrews (OAR/ESRL/GMD), J. B. Miller (OAR/ESRL/GMD), S. J. Lehman, **C. Sweeney (OAR/ESRL/GMD & CIRES),** S. Miller, **K. Thoning (OAR/ESRL/GMD), C. Siso (OAR/ESRL/GMD & CIRES)**, E. Atlas, D. Blake, **J. A. de Gouw (OAR/ESRL/CSD & CIRES), J. B. Gilman (OAR/ESRL/CSD & CIRES), G. Dutton (OAR/ESRL/GMD), J. W. Elkins (OAR/ESRL/GMD), B. D. Hall (OAR/ESRL/GMD)**, H. Chen, M. L. Fischer, M. Mountain, T. Nehrkorn, S. C. Biraud, **F. Moore (OAR/ESRL/GMD & CIRES)** and **P. P. Tans (OAR/ESRL/GMD)**

- Carbon tetrachloride (CCl_4), once commonly used as a solvent and cleaning agent and as an important compound in chemical industry, eats holes in the ozone layer. As a result, production across the globe has been banned for many years for uses that result in CCl_4 escaping to the atmosphere.
- The authors compare CCl_4 emissions reported to the Environmental Protection Agency to what they derived from precise atmospheric measurements of CCl_4 concentrations across the country, and report that emission rates are still 100 times higher than expected on average. The likely source of those unexpected emissions is industrial activity related to the production of chlorinated chemicals (like those ultimately used to create things like Teflon and PVC).
- The most significant hot spot was the Gulf Coast region, with smaller emissions in Colorado and California.

National-scale emissions of carbon tetrachloride (CCl4) are derived based on inverse modeling of atmospheric observations at multiple sites across the United States from the National Oceanic and Atmospheric Administration's flask air sampling network. We estimate an annual average US emission of 4.0 (2.0–6.5) Gg $CCl_4 \, y^{-1}$ during 2008–2012, which is almost two orders of magnitude larger than reported to the US Environmental Protection Agency (EPA) Toxics Release Inventory (TRI) (mean of 0.06 Gg y^{-1}) but only 8% (3–22%) of global CCl_4 emissions during these years. Emissive regions identified by the observations and

consistently shown in all inversion results include the Gulf Coast states, the San Francisco Bay Area in California, and the Denver area in Colorado. Both the observation-derived emissions and the US EPA TRI identified Texas and Louisiana as the largest contributors, accounting for one- to two-thirds of the US national total CCl4 emission during 2008–2012. These results are qualitatively consistent with multiple aircraft and ship surveys conducted in earlier years, which suggested significant enhancements in atmospheric mole fractions measured near Houston and surrounding areas. Furthermore, the emission distribution derived for CCl_4 throughout the United States is more consistent with the distribution of industrial activities included in the TRI than with the distribution of other potential CCl_4 sources such as uncapped landfills or activities related to population density (e.g., use of chlorine-containing bleach).

Publication date: 29 February 2016

Available online:

http://www.pnas.org/content/early/2016/02/23/1522284113.abstract

The design and performance of an automated observer deployment system for the Northeastern United States groundfish fishery

Fisheries Research (1.903)

M. C. Palmer, P. Hersey , H. Marotta, G. R. Shield, and **S. B. Cierpich (NMFS/NEFSC)**

- Description and performance of a first of its kind automated observer deployment system that was developed for the Northeastern United States groundfish fishery.
- Dynamically adjusts observer coverage in response to changes in fishery behavior (ports, fishing region, gear types, etc.).
- Has performed well in its first three years of operation, though areas of future improvement are highlighted.

Historically, a dock intercept process was used to deploy observers in the Northeastern United States groundfish fishery. In this process, the selection of which fishing trips received observer coverage was manually accomplished using pre-defined specifications established by the National Marine Fisheries Service's Northeast Fisheries Science Center. In May 2010, the management of the northeast groundfish fishery underwent major changes affecting the magnitude and

complexity of observer deployment. These changes included: (a) a shift from input controls to a quota based catch-share system; (b) an approximate four-fold increase in the level of observer coverage; and (c) introduction of a new class of trained observers. The manual dock intercept process was insufficient to adequately address these new provisions and an automated observer deployment system, the Pre-Trip Notification System (PTNS), was implemented in the Northeastern United States groundfish fishery on 1 May 2010. The PTNS uses a self-adjusting probability-based, tiered selection process to randomly assign observer coverage across the groundfish fleet on a proportional basis for the purpose of monitoring discards. In this paper, we discuss the general design and performance of the PTNS over the first three years of use with a specific focus the self-adjusting properties of the system, and the impacts of vessel compliance.

Acceptance date: February 3, 2016

ADDITIONAL ARTICLES

NOS Publications

Improved seagrass mapping using linear spectral unmixing of aerial photographs
Estuarine, Coastal, and Shelf Science (2.057)
A. V. Uhrin (NOS/NCCOS) and P. A. Townsend

- Visually-interpreted maps preclude seagrass area estimation and pattern analysis.
- A semi-automated technique for seagrass classification is proposed. This technique relies on both visual interpretation and linear spectral unmixing and identifies small seagrass patches while masking bare substrate.
- Seagrass acreage estimates and spatially resolved maps of pattern are generated.

Mapping of seagrass is challenging, particularly in areas where seagrass cover ranges from extensive, continuous meadows to aggregations of patchy mounds often no more than a meter across. Manual delineation of seagrass habitat polygons through visual photointerpretation of high resolution aerial imagery remains the most widely adopted approach for mapping seagrass extent but polygons often include unvegetated gaps. Although mapped polygon data exist for

many estuaries, these are likely insufficient to accurately characterize spatial pattern or estimate area actually occupied by seagrass. We evaluated whether a linear spectral unmixing (LSU) classifier applied to manually-delineated seagrass polygons clipped from digital aerial images could improve mapping of seagrass in North Carolina. Representative seagrass endmembers were chosen directly from images and used to unmix image-clipped polygons, resulting in fraction planes (maps) of the proportion of seagrass present in each image pixel.

Acceptance date: 11 January 2016

Available online:

http://www.sciencedirect.com/science/article/pii/S027277141630021X

A hierarchical approach to defining marine heatwaves

Progress in Oceanography (3.025)

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- Marine heatwaves cause a range of ecological impacts and require consistent definition to classify
- Metrics were developed to uniquely define these events and three recent marine heatwaves classified using these metrics
- We recommend use of these metrics for future studies.

Marine heatwaves (MHWs) have been observed around the world and are expected to increase in intensity and frequency under anthropogenic climate change. A variety of impacts have been associated with these anomalous events, including shifts in species ranges, local extinctions and economic impacts on seafood industries through declines in important fishery species and impacts on aquaculture. Extreme temperatures are increasingly seen as important influences on biological systems, yet a consistent definition of MHWs does not exist. A clear definition will facilitate retrospective comparisons between MHWs, enabling the synthesis and a mechanistic understanding of the role of MHWs in marine ecosystems. Building on research into atmospheric heatwaves, we propose both a general and specific definition for MHWs, based on a hierarchy of metrics that allow for different data sets to be used in identifying MHWs. We generally define a MHW as a prolonged discrete anomalously warm water event that can be

described by its duration, intensity, rate of evolution, and spatial extent. Specifically, we consider an anomalously warm event to be a MHW if it lasts for five or more days, with temperatures warmer than the 90th percentile based on a 30-year historical baseline period. This structure provides flexibility with regard to the description of MHWs and transparency in communicating MHWs to a general audience. The use of these metrics is illustrated for three 21st century MHWs; the northern Mediterranean event in 2003, the Western Australia 'Ningaloo Niño' in 2011, and the northwest Atlantic event in 2012. We recommend a specific quantitative definition for MHWs to facilitate global comparisons and to advance our understanding of these phenomena.

Acceptance date: 6 January 2016

NMFS Publications

Offshore habitat preference of overwintering juvenile and adult black sea bass, Centropristis striata*, and the relationship to year-class success*
PLOS ONE (3.534)
A. S. Miller, G. R. Shepherd, and **P. S. Fratantoni (NMFS/NEFSC)**
- This study demonstrates how habitat and oceanographic variables affect population dynamics, particularly year-class strength.
- Results provide a perspective on how oceanographic processes on the continental shelf are affecting black sea bass abundance and spatial distribution.

Black sea bass (*Centropristis striata*) migrations are believed to play a role in overwinter survival and connectivity between juvenile and adult populations. This study investigated oceanographic drivers of winter habitat choice and regional differences between populations of juvenile and adult black sea bass. Trends in cohort strength, as a result of juvenile survival, were also identified. Oceanographic and fisheries survey data were analyzed using generalized additive models. Among the oceanographic variables investigated, salinity was the main driver in habitat selection with an optimal range of 33 - 35 practical salinity units (PSU) for both juveniles and adults. Preferred temperature ranges varied between juveniles and adults, but held a similar minimum preference of >8°C. Salinity and temperature ranges also differed by regions north and south of Hudson Canyon.

Shelf water volume had less of an effect than temperature or salinity, but showed an overall negative relationship with survey catch. The effect of winter conditions on juvenile abundance was also observed across state and federal survey index trends. A lack of correlation observed among surveys in the fall paired with a strong correlation in the spring identifies the winter period as a factor determining year-class strength of new recruits to the population. A rank order analysis of spring indices identified three of the largest year classes occurring during years with reduced shelf water volumes, warmer winter shelf waters, and a 34 PSU isohaline aligned farther inshore. While greater catches of black sea bass in the northwest Atlantic Ocean remain south of Hudson Canyon, the species' range has expanded north in recent years.

Expected Publication date: unknown

Increasing the accessibility of acoustic data through global access and imagery
ICES Journal of Marine Science (2.377)
C. C. Wall, **J. M. Jech (NMFS/NEFSC),** and **S. J. McLean (NMFS/NCEI)**
- Demonstrates the utility of large datasets for investigating broad temporal and spatial scale features.
- Demonstrates potential for efficient and effective use of data archives and metadata to analyze underwater acoustic data.

The National Oceanographic and Atmospheric Administration (NOAA) uses water column sonar data to assess physical and biological characteristics from the ocean surface to the seafloor. Acoustic surveys produce large volumes of data that can deliver valuable information beyond their original collection purpose if the data are properly managed, discoverable, and accessible to the public. NOAA's National Centers for Environmental Information, in partnership with NOAA's National Marine Fisheries Service and the University of Colorado, have created a national archive for water column sonar data to help achieve these goals. Through these efforts, over 19 TB of sonar data are now publically available. Raw sonar files are difficult to interpret due to their size, complexity, and proprietary format. In order for users to understand the quality and composition of large volumes of archived data more easily, several visualization products were explored. Three processing methods were applied to multifrequency single-beam data (Simrad EK60) collected off the U.S. northwest coast between 2007 and 2013. One method

illustrates these complex data in a single image using a novel color scale (MFSBI), another examines the nautical area scattering coefficients between two frequencies (ΔNASC), and the third, termed multifrequency indicator (MFI), indexes the data into acoustic classifications. The ability to apply the algorithms efficiently to multi-year datasets was explored. MFSBI proved effective at conveying the composition of the data and was easily adaptable to automated processing. ΔNASC, which required manual seafloor corrections, illustrated a generalized pattern for changes in the water column across the shelf. MFI provided an empirically-based statistical approach but will require more effort in the near term to evaluate and assess the accuracy and precision of each classification. Overall, spatio-temporal patterns of the acoustic backscatter identified large inter-annual variations in composition with the continental shelf break often playing a key role in attracting biological assemblages.

Acceptance date: 20 January 2016

Effects of temperature and salinity on growth of Alexandrium isolates from the Salish Sea

Journal of Phycology (2.239)

B. D. Bill (NMFS/NWFSC), S. K. Moore (NMFS/NWFSC), L. R. Hay, D. M. Anderson, and **V. L. Trainer (NMFS/NWFSC)**

- Derives an empirical growth equation for the toxin-producing dinoflagellate *Alexandrium* as a function of temperature and salinity
- Hindcasting with this empirical equation is able to closely predict when *Alexandrium* blooms are most likely to occur
- This is the start of a more complex model that should increase the ability to forecast *Alexandrium* blooms

Toxin-producing blooms of dinoflagellates in the genus *Alexandrium* (Halim) have plagued the inhabitants of the Salish Sea for centuries. Yet the environmental conditions that promote accelerated growth of this organism, a producer of paralytic shellfish toxins, is lacking. This study quantitatively determined the growth response of two *Alexandrium* isolates to a range of temperatures and salinities, factors that will strongly respond to future climate change scenarios. An empirical equation, derived from observed growth rates describing the temperature and salinity dependence of growth, was used to hindcast bloom risk. Hindcasting

was achieved by comparing predicted growth rates, calculated from *in situ* temperature and salinity data from Quartermaster Harbor, with corresponding *Alexandrium* cell counts and shellfish toxin data. The greatest bloom risk, defined at $\mu > 0.25$ d^{-1}, generally occurred from April through November annually; however, growth rates rarely fell below 0.10 d^{-1}. Except for a few occasions, *Alexandrium* cells were only observed during the periods of highest bloom risk and paralytic shellfish toxins above the regulatory limit always fell within the periods of predicted bloom occurrence. While acknowledging that *Alexandrium* growth rates are affected by other abiotic and biotic factors, such as grazing pressure and nutrient availability, the use of this empirical growth function to predict higher risk time frames for blooms and toxic shellfish within the Salish Sea provides the groundwork for a more comprehensive biological model of *Alexandrium* bloom dynamics in the region and will enhance our ability to forecast blooms in the Salish Sea under future climate change scenarios. These results will ultimately enhance our ability to forecast PSP-causing blooms in the Salish Sea under future climate change scenarios by providing the groundwork for a more comprehensive model that includes other key drivers of Alexandrium bloom dynamics. Ultimately, this approach can help scientists identify habitats that are high risk for blooms and can be used as a guide in other forecasting efforts for Alexandrium, an organism with global impacts.
Expected Publication date: Winter / Spring 2016

Remote sensing of habitat characteristics using echo metrics and image-based seabed classes
ICES Journal of Marine Science (2.377)
G. R. Cutter, Jr., (NMFS/SWFSC), K. L. Stierhoff, (NMFS/SWFSC), and **D. A. Demer (NMFS/SWFSC)**
- Presented is a unique method for the prediction of surficial seabed classes using data from hull-mounted, vertically-oriented fisheries echosounders (4-frequency EK60). The map of modal primary-secondary seabed classes provides more detail about previously unresolved seabed features at 43-Fathom Bank that may be important habitat for rockfishes.
- Employed on a broader scale, our method could refine prediction of seabed habitat distributions for other fish and invertebrate species, and possibly

improved population estimates by incorporating more precise seabed class and habitat information into survey design, by focusing sampling effort in appropriate habitat, and analysis, by refining estimates of habitat area used to calculate abundance from estimates of density.

The seabed can be classified using data from vertical, split-beam echosounders. This was demonstrated recently using a model parameterized with acoustic estimates of slope, roughness, normal-incidence backscattering strength, and variation of backscattering strength by frequency and incidence angle. These seabed classifications were interpreted and validated using published surficial geology maps, but the acoustic data indicated greater spatial variability. Here, classifications of sediment grain or feature size are ascribed to areas on the order of 10 m². First, images of the seabed in the study area are ascribed, based on percent coverage, to seven primary classes ranging from mud through high-relief rock, and 25 primary-secondary classes. Then, a refined seabed classifier, based on the acoustic model parameters is trained, using a nearest-neighbors algorithm, on a subset of the class data. The classifier accurately predicts 96% of the primary classes, and 93% of the primary-secondary classes from an independent data subset. These methods should be useful for characterizing, mapping, and quantifying potential seabed habitat domains of demersal fishes and benthic invertebrates.
Acceptance date: 4 February 2016

The impact of access restrictions on fishery income diversification of US west coast fishermen
Coastal Management (0.877)
D. Holland (NMFS/NWFSC) and **S. Kasperski (NMFS/AFSC)**
- The increasing access restrictions in many marine fisheries through catch shares, license reductions and moratoriums on entry have the potential to limit fishermen's ability to diversify their income across multiple fisheries.
- Diversification often leads reduced financial risk for fishermen.
- The tradeoff between the efficiency gains enabled by restricting access and risk reduction benefits associated with greater diversification should be given more consideration when designing management systems.

Access to most fisheries on the US West Coast was essentially open prior to the mid-1970s when state licenses were first limited for salmon fisheries. Subsequently, licenses to most fisheries on the West Coast have been limited, and the numbers of licenses in many fisheries have been reduced with buyback programs. More recently, catch share programs, which dedicate exclusive shares of catch to individuals or cooperatives, have been introduced in several sectors of the federally managed Pacific groundfish fishery. As access to fisheries has become more restricted, revenue diversification of West Coast fishing vessels has generally declined. This is a source of concern, since diversification has been shown to reduce year-to-year variation in revenue and thus financial risk. However, catch share programs may create more security and stability in vessels' landings which may offset effects of less diversification.   Nevertheless, there may be a tradeoff between the efficiency gains enabled by restricting access and risk reduction benefits associated with greater diversification.

Expected publication date: Unknown

An explicit solution for calculating optimum spawning stock size from Ricker's stock recruitment model

PeerJ (2.112)

M. D. Scheuerell (NMFS/NWFSC)

- Stock recruitment models are used by fisheries managers to calculate the number of offspring that recruit to a fishery
- The author provides an explicit formula to calculate key reference points (maximum sustainable yield and the harvest corresponding to it) used in Ricker's model, a commonly used stock recruitment model. Approximations had previously been used to calculate these reference points.

Stock-recruitment models have been used for decades in fisheries management as a means of formalizing the expected number of offspring that recruit to a fishery based on the number of parents. In particular, Ricker's stock recruitment model is widely used due to its flexibility and ease with which the parameters can be estimated. After model fitting, the spawning stock size that produces the maximum sustainable yield (S_{MSY}) to a fishery, and the harvest corresponding to it (U_{MSY}), are two of the most common biological reference points of interest to fisheries managers. However, to date there has been no explicit solution for either reference

point because of the transcendental nature of the equation needed to solve for them. Therefore, numerical or statistical approximations have been used for more than 30 years. Here I provide explicit formulae for calculating both S_{MSY} and U_{MSY} in terms of the productivity and density-dependent parameters of Ricker's model. Expected Publication date: 25 January 2016
Available online: https://peerj.com/articles/1623/

Ocean acidification affects hemocyte physiology in the Tanner Crab (Chionoecetes bairdi)
PloS ONE (3.234)
S. L. Meseck (NMFS/NEFSC), J. H. Alix (NMFS/NEFSC), K. M. Swiney (NMFS/AFSC), W. C. Long (NMFS/AFSC), G. H. Wikfors (NMFS/NEFSC), and **R. J. Foy (NMFS/AFSC)**

- Ocean acidification has negative effect on the health of tanner crabs.
- Under possible future ocean acidification scenarios, the results showed a significant increase in hemocyte death as well as a reduction in reproductive capabilities as the crabs diverted energy to response to acidification.

We used flow cytometry to determine if there would be a difference in hematology, selected immune functions, and hemocyte pH (pH_i), under two different, future ocean acidification scenarios (pH = 7.50, 7.80) compared to current conditions (pH = 8.09) for *Chionoecetes bairdi*, tanner crab. Hemocytes were analyzed after adult tanner crabs were held for two years under continuous exposure to acidified ocean water. Total counts of hemocytes did not vary among control and experimental treatments; however, there were significantly greater number of dead, circulating hemocytes in crabs held at the lowest pH treatment. Phagocytosis of fluorescent microbeads by hemocytes was greatest at the lowest pH treatment. These results suggest that hemocytes were dying, likely by apoptosis, at a rate faster than upregulated phagocytosis was able to remove moribund cells from circulation at the lowest pH. Crab hemolymph pH (pH_e) averaged 8.09 and did not vary among pH treatments. There was no significant difference in internal pH (pH_i) within hyalinocytes among pH treatments and the mean pH_i (7.26) was lower than the mean pH_e. In contrast, there were significant differences among treatments in pH_i of the semi-granular+granular cells. Control crabs had the highest mean semi-granular+granular pH_i compared to the lowest pH

treatment. As physiological hemocyte functions changed from ambient conditions, interactions with the number of eggs in the second clutch, percentage of viable eggs, and calcium concentration in the adult crab shell was observed. This suggested that the energetic costs of responding to ocean acidification and maintaining defense mechanisms in Tanner crab may divert energy from other physiological processes, such as reproduction.

Expected Publication date: 9 February 2016

Available online:

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0148477

Moving towards dynamic ocean management: How well do modeled ocean products predict species distributions?

Remote Sensing (3.180)

E. A. Becker , **K. A. Forney**, **P. C. Fiedler**, **J. Barlow**, **S. J. Chivers ,** C. A. Edwards , A. M. Moore, and **J. V. Redfern (NMFS/SWFSC)**

- This paper demonstrates that effective species distribution models can be developed using ocean model outputs.
- This work provides new opportunities for dynamic species management (near real time and forecast predictions of species density and distribution).

Species distribution models are now widely used in conservation and management to predict suitable habitat for protected marine species. The primary sources of dynamic habitat data have been in situ and remotely sensed oceanic variables (both are considered "measured data"), but now ocean models can provide historical estimates and forecast predictions of relevant habitat variables such as temperature, salinity, and mixed layer depth. To assess the performance of modeled ocean data in species distribution models, we present a case study for cetaceans that compares models based on output from a data assimilative implementation of the Regional Ocean Modeling System (ROMS) to those based on measured data. Specifically, we used seven years of cetacean line-transect survey data collected between 1991 and 2009 to develop predictive habitat-based models of cetacean density for 11 species in the California Current Ecosystem. Two different generalized additive models were compared: one built with a full suite of ROMS output and another built with a full suite of measured data. Model performance was assessed using the percentage of explained deviance, root mean squared error (RMSE), observed to

predicted density ratios, and visual inspection of predicted and observed distributions. Predicted distribution patterns were similar for models using ROMS output and measured data, and showed good concordance between observed sightings and model predictions. Quantitative measures of predictive ability were also similar between model types, and RMSE values were almost identical. The overall demonstrated success of the ROMS-based models opens new opportunities for dynamic species management and biodiversity monitoring because ROMS output is available in near real time and can be forecast.

Acceptance date: 1 February 2016

Available online: http://www.mdpi.com/2072-4292/8/2/149

Use of satellite data to identify critical periods for early life survival of northern shrimp in the Gulf of Maine
Fisheries Oceanography (2.542)
R. A. Richards, J. E. O'Reilly, and **K. W. Hyde (NMFS/NEFSC)**
- This paper demonstrates a new application of daily satellite data for phenology analysis.
- The authors identify critical periods for survival in early life history of a species (northern shrimp) with high sensitivity to climate warming using satellite derived sea surface temperature data.

The northern shrimp *Pandalus borealis* is at its southern limit in the Gulf of Maine (GOM), and recruitment success is higher in years with relatively cool water temperature. However, the mechanisms for the temperature effect are not clear. We used rolling window analysis of daily satellite data to identify critical periods for early life survival of the 1998-2012 northern shrimp year-classes and to investigate the importance of phenology of the hatch and bloom. Survival was negatively correlated with sea surface temperature (SST) during a six-week period around the time of larval emergence (late winter) and during a four-week period in late summer when SST and stratification reached annual maxima. Survival was negatively correlated with chl-a concentration (chl-a) during two 5-week periods centered about a month before the hatch midpoint and around the time of settlement to the benthos. A small-magnitude winter bloom occurred around the time of the hatch in many years, but our results did not reveal a link between survival and bloom-hatch phenology. Timing of winter and spring blooms were

correlated with SST during the preceding 10 months. A survival model including SST and chl-a during the critical periods explained 73% of the variance in survival. Summer SST increased significantly during the study period; the other critical variables showed no trend. The rolling windows approach revealed sensitive periods in early life history that may not have otherwise been hypothesized, providing a foundation for research towards greater understanding of processes affecting recruitment.

Acceptance date: 20 January 2016

Rockfish assemblage structure and spawning locations in southern California identified through larval sampling
Marine Ecology Progress Series (2.619)
A. R. Thompson, J. R. Hyde, W. Watson, D.C. Chen, and **L. W. Guo (NMFS/SWFSC)**

- Rockfish assemblage structure is spatially heterogeneous in southern California.
- Larger, fished species tend to be more abundant in the eastern part of the Southern California Bight.
- Overall the assemblage is dominated by small species

Differences in oceanographic conditions over short distances can affect dramatically the distribution of marine organisms over small spatial scales. In southern California, oceanographic conditions vary widely from east to west as the offshore region is impacted by cool, southern flowing California Current water, while the inshore is typically warmer and more productive. We investigated how patterns of distribution and abundance of larval, genetically-identified rockfishes related to environmental conditions off southern California, the world's center of rockfish (*Sebastes*) species diversity.   The assemblage was dominated by small and short-lived species that are not targeted by recreational or commercial fishing (shortbelly, *S. jordani* and squarespot, *S. hopkinsi* rockfishes), but also contained moderate abundances of a few larger, targeted species (bank, *S. rufus* and bocaccio, *S. paucispinis* rockfishes). Spawning locations of many species were affected by the environmental variability as abundances of young (0-2 day old), targeted larvae were mostly found offshore in the cool, low chlorophyll a waters that also were relatively shallow and contained hard substrate. By contrast,

untargeted species were more widespread and correlated positively only with hard substrate. Hotspots of species richness and targeted species were high within a large managed region, the Cowcod Conservation Area, indicating that it is protecting important rockfish spawning habitat. This research highlights the need to account for environmental variation in habitat and assemblage structure when conducting marine spatial planning.
Expected Publication date: 1 March 2016

Using domestic and free ranging Arctic canid models for environmental molecular toxicology research
Environmental Science & Technology (5.330)
J. Harley, T. Balmer, F. M. Farin, T. Kavanaugh, K. Dunlap, K. K. Knott, **G. M. Ylitalo (NMFS/NWFSC)**, and T. M. O'Hara

- Indicates that the use of Arctic canid species as models for investigating molecular toxicology of environmental contaminants presents a number of intriguing possibilities.

The use of sentinel species for population and ecosystem health assessments has been advocated as part of a One Health perspective. The Arctic is experiencing rapid change, including climate and environmental shifts, as well as increased resource development, which will alter exposure of biota to environmental agents of disease. Arctic canid species have wide geographic ranges and feeding ecologies and are often exposed to high concentrations of both terrestrial and marine-based contaminants. The domestic dog (*Canis lupus* familiaris) has been used in biomedical research for a number of years, and has been advocated as a sentinel for human health due to its proximity to humans and, in some instances, similar diet. Exploiting the potential of molecular tools for describing the toxocogenomics of Arctic canids is critical for their development as biomedical models as well as environmental sentinels. Here, we present three approaches analyzing toxicogenomics of Arctic contaminants in both domestic and free-ranging canids (Arctic fox, *Vulpes lagopus*). We describe a number of confounding variables that must be addressed when conducting toxicogenomics studies in canid and other mammalian models. The ability for canids to act as models for Arctic molecular toxicology research is unique and significant for advancing our understanding and

expanding the tool box for assessing the changing landscape of environmental agents of disease in the Arctic.

Acceptance date: 5 January 2016

*Summer diving and haul-out behavior of leopard seals (*Hydrurga leptonyx*) near mesopredator breeding colonies at Livingston Island, Antarctic Peninsula*

Marine Mammal Science (1.936)

D. J. Krause (NMFS/SWFSC), **M. E. Goebel (NMFS/SWFSC)**, G. J. Marshall, and K. Abernathy

- The data is newly published and summarizes observations of the foraging behavior of leopard seals from animal-borne video and Time-Depth-Recorder instruments. We provide:
- The first high-resolution records of leopard seal diving behavior,
- Activity budgets and haul-out probabilities which are crucial for regional population estimates and
- Empirical support for several indirect pathways of top-down forcing for Antarctic coastal ecosystems. This study represents a significant step forward in understanding the basic ecology of leopard seals, a large, numerous apex predator in the Southern Ocean that likely affects both international fisheries and indicator species such as fur seals and penguins.

Leopard seals are conspicuous apex predators in Antarctic coastal ecosystems, yet their foraging ecology is poorly understood. Historically, the ecology of diving vertebrates has been studied using high-resolution time-depth records; however, to date such data have not been available for leopard seals. Twenty-one time-depth recorders were deployed on seasonally resident adult females in January and February between 2008 and 2014. The average deployment length was 13.65 ± 11.45 d and 40,308 postfilter dives were recorded on 229 foraging trips. Dive durations averaged 2.20 ± 1.23 min. Dives were shallow with 90.1% measuring 30 m or less, and a mean maximum dive depth of 16.60 ± 10.99 m. Four dive types were classified using a k-means cluster analysis and compared with corresponding animal-borne video data. Dive activity (number of dives/h) was concentrated at night, including crepuscular periods. Haul-out probabilities were highest near midday and were positively correlated with available daylight. Visual observations and comparisons of diving activity between and within years suggest individual-

based differences of foraging effort by time of day. Finally, dive and video data indicate that in addition to at-surface hunting, benthic searching and facultative scavenging are important foraging strategies for leopard seals near coastal mesopredator breeding colonies.

Acceptance date: November 19, 2015

Integrating population dynamics models and distance sampling data: A spatial hierarchical state-space approach

Ecology (4.656)

K. Nadeem, **J. Moore (NMFS/SWFSC)**, Y. Zhang, and H. Chipman

- Improved methodology for estimating population trends from survey data when animal detection is imperfect (e.g,. distance sampling, mark recapture data)
- Provides new abundance and trend estimates for fin whales, for updating NOAA marine mammal stock assessment reports under the MMPA

Stochastic versions of Gompertz, Ricker and various other dynamics models play a fundamental role in quantifying strength of density dependence and studying long term dynamics of wildlife populations. These models are frequently analysed using time series of abundance estimates that are inevitably subject to observation error and missing data. This issues can be addressed with a state-space modeling framework that jointly estimates the observed data model and the underlying stochastic population dynamics (SPD) model. In cases where abundance data are from multiple locations with a smaller spatial resolution (e.g. from mark-recapture and distance sampling studies), models are conventionally fitted to spatially pooled estimates of yearly abundances. Here, we demonstrate that a spatial version of SPD models can be directly estimated from short time series of spatially referenced distance sampling data in a unified hierarchical state-space modeling framework that also allows for spatial variance (covariance) in population growth. We also show that a full range of likelihood based inference, including estimability diagnostics and model selection, is feasible in this class of models using a data cloning algorithm. We further show through simulation experiments that the hierarchical state-space framework introduced herein efficiently captures the underlying dynamical parameters and spatial abundance distribution. We apply our methodology by analysing a time series of line-transect distance sampling data for

fin whales (*Balaenoptera physalus*) off the U.S. west coast. Although there were only seven surveys conducted during the study time frame, 1991-2014, our analysis detected presence of strong density regulation and provided reliable estimates of fin whale densities. In summary, we show that the integrative framework developed herein allows ecologists to better infer key population characteristics such as presence of density regulation and spatial variability in a population's intrinsic growth potential.

Acceptance date: January 12, 2016

Fine scale genetic population structure of loggerhead turtles in the Northwest Pacific

Endangered Species Research (2.259)

Y. Matsuzawa, N. Kamezaki, T. Ishihara, K. Omuta, H. Takeshita, K. Goto, T. Arata, H. Honda, K. Kameda, Y. Kashima, M. Kayo, I. Kawazu, Y. Kumazawa, K. Kuroyanagi, K. Mizobuchi, K. Mizuno, K. Oki, K. K. Watanabe, A. Yamamoto, Y. Yamashita, T. Yamato, T. Hamabata, A. Ishizaki, J. Kodama, and **P. H. Dutton (NMFS/SWFSC)**

- ● This paper defines new demographic partitions to be used as Management Units for loggerheads nesting the northwest Pacific, allowing finer scale management and threats analysis.

Identifying the proper demographically independent populations is important for effective conservation of globally distributed marine species, since it ensures management actions are directed at the appropriate scale. This is particularly challenging for species with complex life histories when local breeding populations have not been adequately sampled. We used mtDNA to analyze the population structure of loggerhead turtles from a total of 555 samples collected from 12 nesting sites in Japan in the Northwest Pacific, including previously unsampled rookeries in the Ryukyu Archipelago for a comprehensive coverage of the nesting distribution. We identified a total of nine haplotypes based on 820bp of the mtDNA control region, including five variants of a single previously described 380bp haplotype. We discovered that one haplotype (CcP1.1) previously rare in the North Pacific is common in the Ryukyu Archipelago. Based on analysis of haplotype frequencies, we found significant differentiation among regionally grouped nesting populations (AMOVA $p<0.0001$, df= 8; pairwise FST ranging

from 0.033 – 0.145). Our results provide evidence to support the recognition of three Management Units (MU) within the NW Pacific Regional Management Unit (RMU). These include 1) Ryukyu MU that includes Okinawa, Okinoerabu and Amami, 2) Yakushima Island MU and 3) a Mainland MU that includes Bousou, Enshu-nada, Shikoku, Kii and Eastern Kyushu. These new data from Japan will provide important baseline data for global genetic stock assessments and contribute to our understanding of the population structure, ecology and life history of this migratory marine species in the northern Pacific.
Expected publication date: April 2016

Modeling food choice in suspension-feeding bivalves
Marine Biology (2.391)
E. P. Espinosa, R. Cerrat, **G. H. Wikfors (NMFS/NEFSC)** and B. Allam
  - Bivalve mollusks capture a greater variety of particles than are actually eaten; we studied how they decide to ingest or reject a particle
  - Binding of extracellular carbohydrates in different microalgae to lectins on the feeding organs of oysters and mussels was found to guide selection
  - A hierarchical decision tree was constructed that prioritizes carbohydrates that are selected for or against by the feeding organs

Bivalve mollusks are among the most important members of bottom-dwelling communities, for both environmental importance and commercial value. Bivalve feeding processes strongly couple water-column and bottom communities, influencing the general well-being of other organisms as well as the overall environment. Because these organisms play such a key role in ecosystems, it is important to understand how they process particulate matter -- sorting and selectively ingesting food particles from a complex mixture -- and what factors control selection. Recent reports have strongly suggested that particle selection in bivalves is mediated by interactions between lectins present in mucus covering the feeding organs and carbohydrates associated with the surface of suspended food particles. In this study, we evaluated several statistical methods to predict the likelihood for a given algae to be ingested or rejected based upon cell-surface carbohydrate signature. Several marine microalgae were investigated and used in feeding experiments with the Eastern oyster Crassostrea virginica and the blue mussel Mytilus edulis. Results show that cell-surface carbohydrates are good

predictors for particle fate, in terms of selection or rejection in a mix. Microalgae rich in glucose/mannose residues were preferentially selected and ingested. Overall, a decision tree that accurately models selection in the two bivalve species is proposed. Because selection in suspension-feeding bivalves is strongly correlated with both exogenous and endogenous factors, more studies are needed to assess this model in bivalves under different physiological conditions. Nevertheless, these findings represent a paradigm shift in our understanding of the mechanism of particle selection and provide a predictive tool that could be used to assess bivalve performance and benthic-pelagic coupling under ecological or aquaculture contexts.
Acceptance date: N/A

Confirmation of stormwater bioretention treatment effectiveness using molecular indicators of cardiovascular toxicity in developing fish
Environmental Science & Technology (5.330)
Jenifer K. McIntyre, **Richard C. Edmunds (NMFS/NWFSC)**, M. G. Redig, E. M. Mudrock, J. W. Davis, **J. P. Incardona (NMFS/NWFSC)**, and **Nat L. Scholz (NMFS/NWFSC)**

- Urban stormwater is exceptionally complex (hundreds or thousands of distinct chemical constituents), and the emerging science suggests that unregulated and even unidentified toxins are undermining the health of NOAA trust resources
- This study shows that simple clean water technologies are very effective at reversing harmful biological effects at both the whole animal and molecular scales

Urban stormwater runoff is a globally significant threat to the ecological integrity of aquatic habitats. Green stormwater infrastructure methods such as bioretention are increasingly used to improve water quality by filtering chemical contaminants that may be harmful to fish and other species. Ubiquitous examples of toxics in runoff from highways and other impervious surfaces include polycyclic aromatic hydrocarbons (PAHs). Certain PAHs are known to cause functional and structural defects in the developing fish hearts. Therefore, normal or abnormal heart development in fish can be a sensitive measure of clean water technology effectiveness. Here we use the zebrafish experimental model to assess the effects

of untreated runoff on the expression of genes that are classically responsive to contaminant exposures, as well as heart-related genes that may underpin the familiar cardiotoxicity phenotype. Further, we assess the effectiveness of soil bioretention for treating runoff, as measured by prevention of both visible toxicity (reduced heart rate, abnormal cardiac looping, pericardial edema) and corresponding gene regulation. We find that contaminants in the dissolved phase of runoff (e.g., PAHs) are causing cardiotoxicity, and that soil bioinfiltration protects against these harmful effects. Molecular markers were more sensitive than visible toxicity indicators, and several cardiac-related genes show promise as novel and sensitive tools for evaluating the effectiveness of evolving stormwater mitigation strategies.

Acceptance date: 4 January 2016

Expected publication date: Winter 2016

Integrating DNA barcoding of fish eggs into ichthyoplankton monitoring programs
Fishery Bulletin (1.694)

L. A. Lewis, **D. E. Richardson (NMFS/NEFSC),** E. Zakharov, and **R. Hanner (NMFS/NEFSC)**

- DNA barcoding was utilized with a high success rate (93%) to genetically identify 1495 fish eggs collected during NEFSC ichthyoplankton sampling.
- Incorporating genetic identification into monitoring programs, including ichthyoplankton and stomach sampling, would open up many new avenues of research.
- A centralized approach to genetic species identification within NMFS could reduce the redundancy that is now present in equipment, effort and personnel, leading to lower overall costs and higher levels of utilization

The data collected through ichthyoplankton monitoring surveys provides valuable insight into the spawning dynamics of multiple species simultaneously. Fish eggs in particular offer a more precise evaluation of species-specific spawning characteristics than do larvae; however, egg collections are greatly underutilized because of the limitations associated with morphology-based identifications. In recent years, a new means of molecular identification, termed DNA barcoding, has made species identification readily available across a broad range of taxa. We used DNA barcoding to identify ethanol-preserved fish eggs collected in 2002–2012

along the northeastern U.S. continental shelf. A subsampling protocol was used to select 1603 unidentified eggs for analysis. Of these, 1495 (93.26%) sequenced successfully, representing 50 species—many of which have either never before been identified to the species-level as eggs or have been identified previously only to a higher taxonomic level or during specific developmental egg stages. In comparison with past attempts at morphological identification, our molecular identifications compose a broader diversity of eggs and demonstrate a technique with high success rates of unambiguous identifications that is not sensitive to egg stage. Overall, this work shows that DNA barcoding of fish eggs is sufficiently advanced to be incorporated into long-term, regional-scale ichthyoplankton monitoring programs.

Acceptance date: 20 January 2016

Expected publication date: Unknown

Tracking growth and survival of rescued boulder corals

Restoration Ecology (1.838)

A. J. Bright (NMFS/SEFSC/CIMAS), **M. W. Miller (NMFS/SEFSC)**, and A. Bourque

- Boulder coral rescue and reattachment is a viable tool that can be implemented in reef rehabilitation efforts following an acute disturbance. Although rapid reattachment is best, stabilization and growth of reattached boulder corals can be observed even when reattachment occurs after a prolonged period of dislodgement.
- Disease or corallivorous snail mitigation may be beneficial following coral reattachment as they differentially affected rescued corals.
- 'Contoured area' estimates provide greater resolution than standard dimension-based size estimates in detecting small growth increments for slow growing boulder coral species.

Patterns of survivorship and growth of rescued boulder corals from two vessel groundings in Biscayne National Park, Florida, USA, were evaluated over five years and compared to nearby undamaged reference corals. The rescued colonies had been dislodged, but reattached in situ ten-twelve years later (hereafter termed 'restored' corals) yielding higher initial levels of old partial mortality for restored corals compared to reference corals. Change in live coral tissue area was assessed

using novel contoured tissue measurements which proved useful in detecting small changes in tissue area for slow-growing coral species. During the five year monitoring period, whole colony mortality was greater for restored corals (13.1%) compared to reference corals (3.3%). For surviving corals, restored coral growth and recent mortality rates were similar to reference corals even though restored corals, especially those of *Dichocoenia stokesii*, had greater disease prevalence (19.7%) than reference corals (6.6%). These results suggest that dislodged boulder coral rescue following an acute disturbance can be an effective tool in stemming tissue loss, especially if rescue can be accomplished in a timely manner.
Acceptance date: 30 Jan 2016

Understanding vulnerability in Alaska fishing communities: A validation methodology for rapid assessment of indices related to well-being
Ocean and Coastal Management (1.748)
A. Himes-Cornell (NMFS), C. Maguire, **S. Kasperski (NMFS/AKFSC)**, K. Hoelting, and R. Pollnac

- This paper presents a first step in validating AFSC's community vulnerability indices.
- The results will be used in the future in combination with the next phase of validation to refine the indices

 The National Oceanic and Atmospheric Administration's Alaska Fisheries Science Center is developing a set of quantitative social and fisheries indices related to well-being that provide measures of distinct theoretical elements of community vulnerability. These indices can be used to identify communities likely to be affected by specific social-ecological perturbations as well as factors influencing communities' sustained participation in fishing activities. In addition to describing development of these quantitative indices, this paper presents a rapid ethnographic assessment methodology that can enhance the evidential validity of the indices, also referred to as groundtruthing. The validation method is used as an initial assessment of construct validity (agreement between quantitative and qualitative measures), construct reliability (consistency across researchers), and external validity (consistency across communities). We selected 13 fishing communities to represent distinct community types generated from a cluster analysis of observable community characteristics. Field observations from these communities were then

used to develop an independent, qualitative comparison measure of well-being. This qualitative data was used to test the construct validity of the quantitative indices. Specifically, this methodology used a test of convergent validity: in theory, the quantitative indices should be highly correlated with the qualitative measure. This comparison helps us understand how well the estimated indices represent real-world conditions observed by researchers. Study findings suggest that some index components exhibit a high degree of construct validity based on high correlations between the quantitative and qualitative measures, while other components will require refinement prior to their application in fisheries decision-making. The method presented can be viewed as a first step in the validation process, where we identify which indices and constructs need refinement. Following this, we suggest additional steps to further our groundtruthing efforts, thus creating an iterative validation process.

Fetal distress and in utero pneumonia in perinatal dolphins during the Northern Gulf of Mexico unusual mortality event

K. M. Colegrove, S. Venn-Watson, **J. Litz (NMFS/SEFSC),** M. J. Kinsel, K. A.Terio, **E. Fougeres (NMFS/SERO), R. Ewing (NMFS/SEFSC),** D. A. Pabst, W. A. McLellan, S. Raverty, J. Saliki, **S. Fire (NOS/NCCOS), G. Rappucci (NMFS/SEFSC), S. Bowen-Stevens (NMFS/SEFSC), L. Noble (NMFS/SEFSC),** A. Costidis, **M. Barbieri (NMFS/OPR),** C. Field, S. Smith, R. H. Carmichael, C. Chevis, W. Hatchett, D. Shannon, M. Tumlin, G. Lovewell, **W. McFee (NOS/NCCOS), T. K. Rowles** (**NMFS/OPR**)

- There was an increase in bottlenose dolphin perinate strandings during the northern Gulf of Mexico unusual mortality event (UME), particularly in Mississippi and Alabama in 2011.
- The UME perinates were more likely to have died in utero or shortly after birth, had fetal distress syndrome, and had in utero pneumonia compared to reference cases.
- During the northern Gulf of Mexico UME, bottlenose dolphins were more susceptible to later term pregnancy failures and the development of in utero infections following the DWH spill.

An unusual mortality event (UME) involving primarily common bottlenose dolphins *Tursiops truncatus* of all size classes stranding along coastal Louisiana, Mississippi, and Alabama started in early 2010 and continued through 2015. During this Northern Gulf of Mexico UME, a distinct cluster of perinatal dolphins (total body length less than 115 cm) stranded in Mississippi and Alabama during 2011. The proportion of annual dolphin strandings that were perinates between 2009 and 2013 were compared to baseline strandings (2000-2005). A case-reference study was conducted to compare demographics, histologic lesions, and Brucella sp. infection prevalence in 69 UME perinatal dolphins to findings from 26 reference perinates stranded in South Carolina and Florida outside of the UME area. UME perinates were more likely to have died in utero or very soon after birth (presence of atelectasis in 88% vs. 15%, $P < 0.0001$), have fetal distress (87% vs. 27%, $P < 0.0001$), and have pneumonia not associated with lungworm infection (65% vs. 19%, $P = 0.0001$) compared to reference perinates. The percentage of perinates with Brucella sp. infections identified via lung PCR was higher among UME perinates stranding in Mississippi and Alabama compared to reference perinates (61% vs. 24%, $P=0.01$) and multiple different Brucella *omp* genetic sequences were identified in UME perinates. These results support that from 2011 to 2013, during the northern Gulf of Mexico UME, bottlenose dolphins were particularly susceptible to late term pregnancy failures and development of in utero infections including brucellosis.

Expected Publication: April 2016

Line cutter for use when releasing large marine organisms caught on longline gear
Fisheries Research (1.903)
C. Bergmann, **J. Barbour**, **L. LaForce**, and **W. B. Driggers III**
(NMFS/SEFSC/Pascagoula Lab)

- A new line cutter design for releasing large marine organisms captured on longline gear outperforms conventional designs.
- The new design allows leader material to be severed in close proximity to the hook, while keeping the captured organism underwater.
- It is inexpensive and reduces stress and potential injury to captured animals.

Releasing large marine organisms captured on longline gear can often be difficult due to problems associated with the use of conventional line cutters. For example,

struggling animals can remain below the water's surface for extended periods, thus providing limited access to the end of the leader nearest the hook. We describe a new line cutter design that outperforms conventional designs. The line cutter described herein can be deployed by a single individual and severs leader material in close proximity to the location of hooks while negating the need to bring the captured organism to the surface. The use of the line cutter reduces stress and potential injury to captured animals, is easily and inexpensively constructed, and has applications beyond its intended use, such as freeing lines snagged or entangled under vessels.

Acceptance date: 19 January 2016

Conservation of native Pacific trout diversity in western North America
Fisheries (2.317)
B. E. Penaluna, **A. Abadía-Cardoso (UCSC & NMFS/SWFSC)**, J. B. Dunham, F. J. García de León, R. E. Gresswell, A. Ruiz Luna, E. B. Taylor, B. B. Shepard, R. Al-Chokhachy, C.C. Muhlfeld, K.R. Bestgen, K. Rogers, M. A. Escalante, E. R. Keeley, G. Temple, J. E. Williams, K. Matthews, R. Pierce, R. L. Mayden, R. P. Kovach, **J. C. Garza (NMFS/SWFSC)**, and K. D. Fausch

- A summary of geographic and phylogeographic diversity of trout in the genus *Oncorhynchus*, with a brief description of major conservation challenges facing them.

Pacific trout (*Oncorhynchus* spp.) in western North America are strongly valued from ecological, socioeconomic, and cultural views, and have drawn the attention of substantial research and conservation efforts. In spite of this, an understanding of their evolutionary histories, overall diversity, and challenges to their conservation is incomplete. We review the state of knowledge on these important issues, focusing on Pacific trout within the genus *Oncorhynchus*. Although most research on salmonid fishes emphasizes Pacific salmon, we focus on Pacific trout because they share a common evolutionary history and in western North America many taxa have not been formally described, particularly in the southern extent of their ranges. Research in recent decades has led to the revision of many hypotheses concerning the origin and diversification of Pacific trout throughout their range. Although there has been significant success in addressing past threats to Pacific trout, contemporary and future threats represented by nonnative species, land and

water use activities, and climate change pose challenges and uncertainties. Ultimately, conservation of Pacific trout depends on how well these issues are understood and addressed, and on the solutions that allow these species to coexist with a growing scope of human influences.

Acceptance date: 13 January 2016

*Size at maturity for grooved Tanner crab (*Chionoecetes tanneri*) along the U.S. west coast (Washington to California)*

Fisheries Oceanography (2.543)

A. Keller, **J. C. Buchanan**, **E. Steiner**, **D. Draper**, **A. Chappell**, **P. H. Frey**, and **M. A. Head (NMFS/NWFSC)**

- Determining the expected temporal and spatial variability in the size at maturity is essential prior to establishing a fishery for grooved Tanner crab along the U.S. west coast.
- The authors observed significant variations in the size at maturity along a latitudinal gradient, with increases observed for both male and female grooved Tanner crab from north (Bering Sea) to south (U.S. west coast), and potentially over time (1982 to 2014).
- A size limit greater than the size of 50% maturity would protect breeding stocks and prevent recruitment overfishing.
- In addition to size limits, all crab fisheries in Alaska are restricted to male-only fisheries and similar restrictions should be considered for grooved Tanner crab catch along the west coast (U.S.–Canada to U.S.–Mexico) as an additional conservation measure.

We conducted a multiyear study to examine interannual variability in mean size (carapace width, mm), maturity size (mm), and depth (m) for grooved Tanner crab*(Chionoecetes tanneri* Rathbun, 1893) along the U.S. west coast. An additional goal was to provide updated, estimates of carapace width (mm) at 50% maturity (W_{50}) for male and female grooved Tanner crab and assess changes over time. Randomly selected samples came from trawl surveys undertaken annually by the Northwest Fisheries Science Center at depths of 55 to 1280 m. We used allometric relationships between carapace width and either abdominal width (females) or chela length (males) to determine functional maturity by sex. We evaluated maturity by fitting logistic regression models to proportion mature. W_{50} varied

significantly between males (125.2 mm) and females (89.1 mm) but interannual differences were slight. Annual mean carapace widths (CW) were greater for mature males (139.9 – 143.4 mm) relative to females (98.8 – 100.4 mm). Average sizes of immature grooved Tanner crab varied between sexes with males (75.7 – 84.6 mm) larger than females (66.7 – 71.9 mm). Size frequency distributions indicated little overlap in size of mature male and female grooved Tanner crab but considerable overlap between immature grooved Tanner crab. The best model expressing complexity in growth incorporated width, sex, and maturity stage. Depth ranged from 195 – 1254 m with the average depth of mature grooved Tanner crab (females, 737 m; males, 767 m) significantly shallower than immature (females, 949 m; males, 918 m) grooved Tanner crab.

Acceptance date: 20 January 2016

Expected publication date: Winter 2016

A state-space approach to incorporating environmental effects on recruitment in an age-structured assessment model with an application to Southern New England yellowtail flounder

Canadian Journal of Fisheries and Aquatic Sciences (2.276)

T. J. Miller, J. A. Hare, and **L. Alade (NMFS/NEFSC)**

- ● This paper represents a new approach to the incorporation of environmental information into stock assessment models
- ● This paper highlights how the Mid-Atlantic Cold Pool can improve recruitment predictions for southern New England yellowtail flounder

The state-space model framework provides a natural, probabilistic approach to stock assessment by modeling the stochastic nature of population survival and recruitment separately from sampling uncertainty inherent in observations on the population. We propose a state-space assessment model that is expanded to simultaneously treat environmental covariates as stochastic processes and estimate their effects on recruitment. We apply the model to Southern New England yellowtail flounder using data from the most recent benchmark assessment to evaluate evidence for effects of the Mid-Atlantic cold pool and spawning stock biomass on recruitment. Based on AIC, both the cold pool and spawning stock biomass effects on recruitment were important predictors of recruitment and led to annual variation in estimated biomass reference points and associated yield. We

also demonstrate the effect of the stochasticity of the Mid-Atlantic cold pool on short-term forecasts of the stock size, biomass reference point, and stock status. Expected Publication date: 2016

Shifts of sensory modalities in early life history stage estuarine fishes (Sciaenidae) from the Chesapeake Bay using X-ray micro computed tomography
Environmental Biology of Fishes (1.356)
A. L. Deary, B. Metscher, **R. W. Brill (NEFSC),** and E. J. Hilton

- Due to substantial increases in the human population along coastal areas over the last century, the sensory environment in estuarine and inshore areas (especially in the Chesapeake Bay and its tributaries) has changed at rates faster than fishes can adapt to the new prevailing conditions
- To establish a baseline of sensory abilities, this paper assessed the ontogenetic patterns of sensory modality of sciaenid fish using X-ray micro computed tomography (microCT) to image and measure the relative size of brain regions associated with olfaction, vision, gustation, audition, and mechanoreception
- Results indicate that vision is the dominant sense during early ontogeny in all species studied
- Ongoing changes in the visual environment could have significant population/ecological impacts

Increases in human populations along coasts have altered estuarine nursery habitats that are important for many aquatic organisms. These perturbations include changes to the sensory environment due to increased turbidity resulting from runoff and nutrient loading and these changes are occurring faster than fishes can adapt to the new prevailing conditions. To better understand how modifications to the sensory environment may impact fishes during early life history stages (ELHS), it is necessary to describe the senses used to locate food and evade predators during ontogeny. The drums (Sciaenidae) exhibit substantial morphological diversity in their peripheral sense organs as adults. We used the relative volumes of brain structures to assess ontogenetic changes in the sensory modalities of three sciaenid species from different foraging guilds. Early stage sciaenids were imaged using X-ray micro computed tomography. The optic tract was the largest sensory region, suggesting that vision is the primary sense in

sciaenids, regardless of size, species, or foraging habitat. There were differences in the relative proportions of the other sensory areas according to foraging guild. These differences suggest that *Cynoscion nebulosus* (a pelagic forager) relies on audition and mechanoreception through ontogeny to augment vision, whereas *Sciaenops ocellatus* (a generalist) uses olfaction, audition, and mechanoreception. In contrast, *Leiostomus xanthurus* (a benthic forager) relies on olfaction and gustation. We suggest that the ontogenetic trends in sensory modality described in sciaenids from the Chesapeake Bay (USA) can be used in future research to ascertain the potential species-specific impacts of water quality change on ELHS fishes.

Acceptance date: 19 January 2016

Risk analysis of plausible incidental exploitation rates for Pacific Sleeper Sharks Somniosus pacificus: a data-poor species in the Gulf of Alaska
North American Journal of Fisheries Management (1.110)
D. Courtney (NMFS/SEFSC), M. D. Adkison, and **M. F. Sigler (NMFS/AKFSC)**

- This paper describes development of a stock assessment method for data-poor species management
- These results indicate that a priority for management is to reduce the uncertainty in Pacific Sleeper Shark exploitation rates
- An observer program now in place to monitor the Pacific halibut fishery should reduce this uncertainty

Monte Carlo simulation was used to investigate the sustainability of incidental Pacific Sleeper Shark (*Somniosus pacificus)* exploitation rates in the Gulf of Alaska under status quo management. Monte Carlo simulations were implemented with a standard length-based age-structured model evaluated with forward projection. Given the paucity of relevant data, the sensitivity of simulation results was investigated to a range of assumptions about key model parameters using a total of 24 alternative model configurations, each of which was simulated 1,000 times. The risk analysis results were most sensitive to Pacific Sleeper Shark incidental exploitation rates. The aggregate fraction of simulations ending in an overfished condition increased from zero under the low exploitation rate scenario to 59% under the high exploitation rate scenario. Risk analysis results were also

sensitive to the assumed shape of length-based selectivity (asymptotic-shaped or dome-shaped) but were less sensitive to the range of assumptions about other key model parameters including maximum age, and stock productivity. These results indicate that a priority for management is to reduce the uncertainty in Pacific Sleeper Shark exploitation rates. An Observer Program is now in place to monitor the historically unobserved Pacific Halibut (*Hippoglossus stenolepis)* fishery in the Gulf of Alaska, which incidentally catches Pacific Sleeper Sharks; this change will reduce this major uncertainty.
Acceptance date: 12 January 2016

Estuarine residency and migration of Southern Flounder inferred from conventional tag returns at multiple spatial scales
Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science (1.592)
J. K. Craig (NMFS/SEFSC), W. E. Smith, F. S. Scharf, and J. P. Monaghan
   ● Delineation of stock structure relevant to management unit for Southern Flounder
   ● New information on migration and movement dynamics of harvested estuarine species

An improved understanding of the spatial structure and movements of harvested populations can promote more efficient management of marine resources. Conventional tagging is a valuable approach to study the movements of marine fishes due to its relatively low expense and the typically broad spatial extent over which movements can be characterized. We present the findings of multiple tag-return studies initiated in the estuaries of North Carolina during the past two decades to better understand habitat residency and migration patterns of Southern Flounder, *Paralichthys lethostigma*, an economically important marine flatfish in the southeastern U.S. Tag-return data indicated large-scale (> 50 km) movements of relatively large fish in the fall that were presumably associated with offshore winter spawning migrations. Nearly all Southern Flounder that demonstrated large-scale movement were recovered to the south of the system in which they were tagged, suggesting that the spawning activity of fish using North Carolina estuaries may be concentrated mostly off the southeastern U.S. continental shelf. Tag returns from within multiple estuarine systems during the spring and summer

were in close proximity to release sites (typically < 1 km), suggesting limited movement during estuarine residency. Recaptures in the spring of fish tagged the previous summer or fall were also in close proximity to release sites, in some cases within the same estuarine creek, indicating limited movement of fish overwintering in the estuary as well. Our findings reveal saltatory movement dynamics of Southern Flounder characterized by limited movement during estuarine residency and large-scale movements in the fall associated with spawning migrations. Our synthesis of several tag-return studies across multiple spatial scales should contribute to a better alignment of Southern Flounder management and their spatial dynamics.

Expected publication date: November 3, 2015

Applying portfolio management to implement ecosystem-based fishery management

North American Journal of Fisheries Management (0.954)

D. Jin, **G. DePiper (NMFS/NEFSC),** and P. Hoagland

- In a multispecies/multi-use context trade-offs are critical and risk must be managed.
- Portfolio management is a flexible tool which allows the expected value of management actions to be traded off against the higher moments of the value's distribution in order to maximize the probability of attaining targeted returns, thus minimizing economic risk.
- This portfolio analysis can be used at numerous spatial aggregations (Large Marine Ecosystem, State, Port), in order to understand where the burden of risk in the system lies and how management decisions affect that burden.

Portfolio management has been suggested as a tool to help implement ecosystem-based fisheries management (EBFM). The portfolio approach involves the application of financial portfolio theory to multispecies fishery management to account for species interdependencies, uncertainty, and sustainability constraints. By considering covariance among species, this approach allows economic risks and returns to be calculated across varying combinations of stock sizes. Tradeoffs between expected aggregate returns and portfolio risk can thus be assessed. We develop a procedure for constructing portfolio models to help implement EBFM in the northeastern United States, using harvest data from the National Marine

Fisheries Service. Extending the work of Sanchirico *et al.* (2008), we propose a measure of excessive risk taking, which may be used by managers to monitor signals of non-optimal harvests. In addition, we conduct portfolio assessments of historical commercial fishing performance at different accounting stances: the large marine ecosystem, the New England region, and the community (fishing ports). We show that portfolio analysis could inform management at each level. Results of the study suggest that excessive risk taking is associated with overfishing, and risk management is therefore important for ensuring sustainability.

Expected publication date: May 14, 2016

A safer catch? The effects of catch share management on fishing safety
Proceedings of the National Academy of Sciences (9.674)
L. Pfeiffer (NMFS/NWFSC) and T. Gratz

- The individual allocation of fishing quota (rights-based management) can improve safety by solving many of the problems associated with the competitive "race to fish", which manifest themselves in risky behavior such as fishing in poor weather or overloading vessels
- We show that catch shares decreased the average annual rate of fishing in poor weather by 79 percent in the West Coast Sablefish fixed gear fishery
- Institutions and management can significantly affect individual, voluntary risk exposure by fishermen

Commercial fishing is a dangerous occupation despite decades of regulatory initiatives aimed at making it safer. We posit that rights-based fisheries management (the individual allocation of fishing quota to vessels or fishing entities, also called catch shares) can improve safety by solving many of the problems associated with the competitive "race to fish" experienced in fisheries around the world. The competitive nature of such fisheries results in risky behavior such as fishing in poor weather, overloading vessels with fishing gear, and neglecting maintenance. While not necessarily intended to address safety issues, catch shares eliminate many of the economic incentives to fish as rapidly as possible. We develop a dataset and methods to empirically evaluate the effects of the adoption of catch shares management on a particularly risky type of behavior: the propensity to fish in stormy weather. After catch shares was implemented in an

economically important U.S. West Coast fishery, a fisherman's probability of taking a fishing trip in high wind conditions decreased by 82 percent, compared to only 31 percent in the former "race to fish" fishery. Overall, catch shares caused the average annual rate of fishing on high wind days to decrease by 79 percent. This is evidence that institutional changes can significantly reduce individual, voluntary risk exposure and result in safer fisheries.

Expected publication date: February 2016

Round-the-Coast: Snapshots of estuarine climate change effects
Fisheries Magazine
K. Limburg, R. Brown, **R. Johnson (NMFS/SWFSC)**, B. Pine, R. Rulifson,
D. Secor, K. Timchak, B. Walther, and K. Wilson

- This article highlights climate driven changes in diverse estuaries around the United States.

Climate change is manifesting in different ways in different waters. When fresh water meets the sea, the particulars of configurations, geographic location, relative watershed influence, and tidal harmonics set the template for how changes occur in estuaries. To get a quick sense of how estuaries are changing, we provide glimpses from around the U.S. coasts, from Alaska, down the West Coast, the Gulf Coast, and up the East Coast to Maine. These reveal a wide variety of responses due to location and eco-region.

Publication date: Unknown (Acceptance date: 7 February 2016)

Polychlorinated biphenyls and organochlorine pesticides as intrinsic tracer tags of foraging grounds of bluefin tuna in the Northwest Atlantic Ocean
Marine Pollution Bulletin (2.991)
A. D. Deshpande (NOAA/NEFSC), R. M. Dickhut, **B. W. Dockum
(NOAA/NEFSC), R. W. Brill (NOAA/NEFSC),** and **C.
Farrington(NOAA/NEFSC)**

- Unique signatures of naturally bioaccumulated polychlorinated biphenyl congeners (PCBs) and organochlorine pesticides like chlordanes provided a relatively low-cost, non-lethal method for understanding bluefin tuna migratory trends, mixing, and population dynamics.

- Discriminant function analysis of unique PCB signatures in each capture area suggested the fidelity of bluefin tuna to a particular foraging ground.
- Relatively high PCBs in conjunction with the significantly low chlordanes suggest Mediterranean Sea as the origin or primary foraging ground of bluefin tuna. Alternatively, higher chlordanes are unique chemical tags for bluefin tuna feeding in the northwestern Atlantic.

Researchers have utilized chemical fingerprints in the determination of habitat utilization and movements of the aquatic animals. In the present effort, we analyzed polychlorinated biphenyl (PCB) congeners and organochlorine pesticides in the samples of juvenile bluefin tuna caught offshore of Virginia, and in larger bluefin tuna from the Gulf of Maine and near Nova Scotia. Average contaminant concentrations from fish captured from the three locations were not significantly different; and PCBs, DDTs, and chlordanes correlated well with each other. Trans-nonachlor/PCB 153 ratios in bluefin tuna of eastern Atlantic (i.e., Mediterranean) origin are low compared to the corresponding ratios in fish in the western Atlantic. As the former migrate to the western Atlantic, these ratios gradually turnover due to the accumulation of biomass from forage contaminated with higher trans-nonachlor/PCB 153 ratio reflecting dissimilar use of chlordane pesticides on two sides of the Atlantic Ocean. A discriminant function analysis (DFA) plot of total PCB normalized signatures of PCB congeners showed three separate clusters, which suggested that bluefin tuna from offshore Virginia, Gulf of Maine, and Nova Scotia could have had extended residences and foraging within the areas of capture to be able to sustain the stable signatures of PCB congeners. The DFA cluster results supported the metapopulation theory of spatial ecology comprising discrete aggregates of local populations of bluefin tuna where the desired prey species are likely to be abundant. Despite their highly migratory trait and endothermic advantage of foraging in broader and colder habitats, the movements and mixing across the aggregation ranges related to feeding did not appear to be extensive. Advancement in the understanding of bluefin tuna population dynamics beyond the coarse concept of trans-Atlantic migrations to the metapopulation hypothesis provides a novel exploratory tool in the stock assessment and resource management. As the chemical tracer tags are fortified naturally and document the foraging history, they promise to serve as the low-cost alternatives to the high-cost electronic data recording tags employed for addressing the migratory movements

of bluefin tuna. Between the different potential chemical tracer tags, a distinct advantage of PCB/pesticide analysis over the otolith micro-constituent analysis is that the muscle tissue of a given individual bluefin tuna can be sampled repeatedly for PCB/pesticide analysis over different spatial and temporal scales in a non-lethal manner.

Acceptance date: 4 February 2016

NWS Publications

Observations and operational considerations of the 4 June 2013 Chaff Event in northern Alabama

Journal of Operational Meteorology (1.702)

T. A. Murphy, R. A. Wade, and **B. C. Carcione (NWS)**

● This paper highlights the unique nature of the chaff release and provides valuable insight into detecting and diagnosing chaff releases using the WSR-88D.

On 4 June 2013, a military chaff release occurred near Huntsville, Alabama, within the University of Alabama in Huntsville (UAH) mesoscale network. This event was unusual because the chaff remained in the atmosphere—maintaining a radar echo on nearby weather radars—for nearly 10 h after the initial release. This paper examines the radar evolution of the chaff event, supplemented by environmental observations using the UAH profiling equipment. Additionally, unique operational considerations faced by the National Weather Service Weather Forecast Office in Huntsville are addressed.

Expected Publication date: 2 February 2016

Available online: http://dx.doi.org/10.15191/nwajom.2016.0403

OAR Publications

Net community production and calcification from seven years of NOAA Station Papa Mooring measurements

Global Biogeochemical Cycles (3.965)

A. J. Fassbender, C. L. Sabine, and **M. F. Cronin (OAR/PMEL)**

● Significant seasonality found in NCP including fall and winter heterotrophy

- Elevated PIC:POC ratio relative to the global average
- Continuous in situ observations are required to develop a robust carbon cycle baseline

Seven years of near-continuous observations from the Ocean Station Papa (OSP) surface mooring were used to evaluate drivers of marine carbon cycling in the eastern subarctic Pacific. Processes contributing to mixed layer carbon inventory changes throughout each deployment year were quantitatively assessed using a time-dependent mass-balance approach in which total alkalinity and dissolved inorganic carbon were used as tracers. By using two mixed layer carbon tracers it was possible to isolate the influences of net community production (NCP) and calcification. Our results indicate that the annual NCP at OSP is 2 ± 1 mol C m-2 yr-1 and the annual calcification is 0.3 ± 0.3 mol C m-2 yr-1. Piecing together evidence for potentially significant dissolved organic carbon cycling in this region, we estimate a particulate inorganic carbon to particulate organic carbon ratio between 0.15 and 0.25. This is at least double the global average, adding to the growing evidence that calcifying organisms play an important role in carbon export at this location. These results, coupled with significant seasonality in the NCP, suggest that carbon cycling near OSP may be more complex than previously thought, and highlight the importance of continuous observations for robust assessments of biogeochemical cycling.

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Circulation and water renewal of Florida Bay, USA
Bulletin of Marine Science (1.503)
T. Lee, N. Melo, N. Smith, **E.M. Johns (OAR/AOML), C.R. Kelble (OAR/AOML), R.H. Smith (OAR/AOML)**, and P. B. Ortner

- This paper synthesizes results from a multi-year study of the circulation and exchange processes controlling transport and water renewal in Florida Bay.
- Wind forcing is shown to be the primary driver of the circulation, and exchange times are computed for each subregion.
- A practical solution to control hypersalinity, seagrass die-off and water quality degradation of Florida Bay is proposed

The circulation and exchange processes controlling transport and water renewal within the western subregion of Florida Bay, USA, are presented and compared to our previous findings for the north-central and northeast subregions of the bay. We find there is a common bank/basin flow response to wind forcing that is the primary driver of water renewal for each of the regions studied. Florida Bay is a patchwork of shallow basins surrounded by very shallow banks that are cut through with deeper channels connecting to nearby basins. We observed that, for each subregion studied, there was a net downwind basin outflow through the larger channels that was approximately balanced by a net basin inflow over the surrounding shallow banks. The resulting basin through flows are used to estimate exchange times for renewal of western basin waters of approximately 1 mo. This exchange time is sufficient to prevent hypersalinity and degradation of water quality in the western basin, in contrast to the north-central subregion, where hypersalinity development is an annual occurrence. Our results highlight the importance of wind induced water renewal in shallow coastal bays with weak to moderate tidal exchange. In addition, we have discovered a significant clockwise circulation pattern through the western basins from strong inflows of coastal waters through Flamingo Channel that turn southward through the western basins before rejoining the coastal flow toward the Florida Keys tidal passages and Atlantic coastal zone. A practical solution to control hypersalinity, seagrass die-off, and water quality degradation of Florida Bay is proposed.

Expected Publication date: 19 February 2016

Available online: http://www.ingentaconnect.com/content/umrsmas/bullmar/pre-prints/content-bms_9212

Fifteen years of ocean observations with the global Argo array

Nature Climate Change (14.547)

S. C. Riser, H. J. Freeland, D. Roemmich, S. Wijffels, A. Troisi, M.Belbéoch, D. Gilbert, J. Xu, S. Pouliquen, A.Thresher, P-Y. Le Traon, G. Maze, B. Klein, M. Ravichandran, Fiona Grant, P-M.Poulain, T. Suga, B. Lim, A. Sterl, P.Sutton, K.-A. Mork, P. Joaquín Vélez-Belchí, I. Ansorge, B. King, J. Turton, **M. Baringer (OAR/AOML),** and S.R. Jayne

- Highlights how the Argo program has allowed for large-scale sampling of the ocean on a global scale

More than 90% of the heat energy accumulation in the climate system between 1971 and the present has been in the ocean. Thus, the ocean plays a crucial role in determining the climate of the planet. Observing the oceans is problematic even under the most favourable of conditions. Historically, shipboard ocean sampling has left vast expanses, particularly in the Southern Ocean, unobserved for long periods of time. Within the past 15 years, with the advent of the global Argo array of profiling floats, it has become possible to sample the upper 2,000 m of the ocean globally and uniformly in space and time. The primary goal of Argo is to create a systematic global network of profiling floats that can be integrated with other elements of the Global Ocean Observing System. The network provides freely available temperature and salinity data from the upper 2,000 m of the ocean with global coverage. The data are available within 24 hours of collection for use in a broad range of applications that focus on examining climate-relevant variability on seasonal to decadal timescales, multidecadal climate change, improved initialization of coupled ocean–atmosphere climate models and constraining ocean analysis and forecasting systems.

Publication date: 27 January 2016

Available online:

http://www.nature.com/nclimate/journal/v6/n2/pdf/nclimate2872.pdf

Paper identifies variability of preferred environmental conditions for Atlantic Bluefin tuna larvae in the Gulf of Mexico

Fisheries Oceanography (2.542)

A. J. Hobday, L. V. Alexander, S. E. Perkins, D. A. Smale, S. C. Straub, E. C. J. Oliver, J. Benthuysen, M. T. Burrows, M. G. Donat, M. Feng, N. J. Holbrook, P. J. Moore, **H. A. Scannell (OAR/PMEL),** A. S. Gupta, and T. Wernberg

Marine heatwaves cause a range of ecological impacts.

- This paper proposes a consistent definition of marine heatwaves that will advance comparison
- The use of this definition will provide transparency when communicating about marine heatwaves to a general audience

Marine heatwaves (MHWs) have been observed around the world and are expected to increase in intensity and frequency under anthropogenic climate change. A variety of impacts have been associated with these anomalous events, including

shifts in species ranges, local extinctions and economic impacts on seafood industries through declines in important fishery species and impacts on aquaculture. Extreme temperatures are increasingly seen as important influences on biological systems, yet a consistent definition of MHWs does not exist. A clear definition will facilitate retrospective comparisons between MHWs, enabling the synthesis and a mechanistic understanding of the role of MHWs in marine ecosystems. Building on research into atmospheric heatwaves, we propose both a general and specific definition for MHWs, based on a hierarchy of metrics that allow for different data sets to be used in identifying MHWs. We generally define a MHW as a prolonged discrete anomalously warm water event that can be described by its duration, intensity, rate of evolution, and spatial extent. Specifically, we consider an anomalously warm event to be a MHW if it lasts for five or more days, with temperatures warmer than the 90th percentile based on a 30-year historical baseline period. This structure provides flexibility with regard to the description of MHWs and transparency in communicating MHWs to a general audience. The use of these metrics is illustrated for three 21st century MHWs; the northern Mediterranean event in 2003, the Western Australia 'Ningaloo Niño' in 2011, and the northwest Atlantic event in 2012. We recommend a specific quantitative definition for MHWs to facilitate global comparisons and to advance our understanding of these phenomena.
Acceptance date: 6 January 2016

Cross Line Office Publications

Decadal comparison of a diminishing coral community: a case study using demographics to advance inferences of community status
PeerJ (2.112)
M. W. Miller (NMFS/SEFSC), D. E. Williams (NMFS/SEFSC/CIMAS), B. E. Huntington (NMFS/SEFSC/NRC), G. A. Piniak (NOS/NCCOS), M. J. A. Vermeij
   ● While traditional photo quadrat-based monitoring has demonstrated significant coral declines on Navassa Island reefs over the past decade, coral demographic sampling revealed significant changes in rarer species, including some that increased significantly.

- *Orbicella* spp. corals, recently listed as ESA threatened, showed significant declines in all parameters (live cover, colony density, and size structure).

The most common coral monitoring methods estimate coral abundance as percent cover, either via in situ observations or derived from images. In recent years, growing interest and effort has focused on colony-based (demographic) data to assess the status of coral populations and communities. In this study, we relied on two separate data sets (photo-derived percent cover estimates, 2002-12, and opportunistic in situ demographic sampling, 2004 and 2012) to more fully infer decadal changes in coral communities at a small, uninhabited Caribbean island. Photo-derived percent cover documented drastic declines in coral abundance including disproportionate declines in *Orbicella* spp. While overall in situ estimates of total coral density were not different between years, densities of several rarer taxa were. *Meandrina meandrites* and *Stephanocoenia intersepta* increased while *Leptoseris cucullata* decreased significantly, changes that were not discernable from the photo-derived cover estimates. Demographic data also showed significant shifts to larger colony sizes (both increased mean colony sizes and increased negative skewness of size frequency distributions, but similar maximum colony sizes) for most taxa likely indicating reduced recruitment. *Orbicella* spp. differed from this general pattern, significantly shifting to smaller colony sizes due to partial mortality. Both approaches detected significant decadal changes in coral community structure at Navassa, though the demographic sampling provided better resolution of more subtle, taxon-specific changes.
Acceptance date: 9 January 2016
Available online: https://peerj.com/articles/1643/

Epibenthic community assessments indicate high spatial and temporal variability among continental shelf hard bottom sites in a marine transition zone
Regional Studies in Marine Science
D. W. Freshwater, **P. E. Whitfield (NOS/NCCOS), C. A. Buckel, (NOS/NCCOS)**, **R. C. Muñoz (NMFS/SEFSC)**, and **B. P. Degan (NOS/NCCOS)**

- Onslow Bay, NC epibenthic communities varied significantly both by site and year.

- Depth was the most important factor in structuring Onslow Bay epibenthic communities.
- Macroalgae dominate the community at shallower sites, while macroalgae and sessile invertebrates share dominance at deeper sites.

We studied 19 hard bottom sites within Onslow Bay, North Carolina during 2007-2010 using photoquadrat analyses to investigate the role of temperature, depth, and fish community variables in the structure of the epibenthic (macroalgae and sessile invertebrates) community. Although significant variation in community structure was found both by site and year, depth was the most important factor in structuring these epibenthic communities with significant differences found among five depth categories: 18-20 m; 24-29.2 m; 31 m; 32.5-37 m; 38.5-42 m. The largest community difference was found between depths ≤31 m and ≥32.5 m, resulting in a shift from macroalgae dominance at the shallower sites to shared macroalgae and sessile invertebrate dominance at deeper sites. Depth is a complicated variable as it relates to structuring the epibenthic community in this region because it reflects varying winter bottom water temperatures, light levels, and periodicity of nutrient influxes. The location of North Carolina marine habitats at the transition from cold-temperate to warm-temperate/tropical zones, and the spatial compression of this transition zone along inshore to offshore transects make this an ideal area for tracking climate change related shifts in marine communities. However, a better understanding of the relationship among variables such as depth, light, temperature and nutrients and the epibenthic community, as well as seasonal and short annual community variation, is needed before climate related shifts can be determined.
Acceptance date: 12 Jan 2016

Multi-Radar Multi-Sensor (MRMS) severe weather and aviation products: Initial operating capabilities
Bulletin of the American Meteorological Society (11.57)
T. M. Smith (OAR/NSSL), V. Lakshmanan (OAR/NSSL), G. J. Stumpf (NWS/MDL), K. L. Ortega (OAR/NSSL), K. Hondl (OAR/NSSL), K. Cooper (OAR/NSSL), K. M. Calhoun (OAR/NSSL), D. M. Kingfield (OAR/NSSL), K. L. Manross (OAR/ESRL), R. Toomey (OAR/NSSL), and **J. Brogden (OAR/NSSL**)

● This paper summarizes the initial operating capabilities of the MRMS-Severe Weather applications and 3D radar mosaicking capability built on the WDSS-II infrastructure, which is the core of MRMS functionality.

● The authors also cover the history of development and testing of the system.

The Multi-Radar Multi-Sensor (MRMS) system, which was developed at the National Severe Storms Laboratory and University of Oklahoma, was made operational in 2014 at the National Centers for Environmental Prediction. The MRMS system consists of the Warning Decision Support System—Integrated Information suite of severe weather and aviation products, and the quantitative precipitation estimation products created by the National Mosaic and Multi-sensor Quantitative Precipitation Estimation system. Products created by the MRMS system are at a spatial resolution of approximately 1 km, with 33 vertical levels, updating every 2 minutes over the Coterminous United States and southern Canada. This paper describes initial operating capabilities for the severe weather and aviation products that include a three dimensional mosaic of reflectivity, guidance for hail, tornado, and lightning hazards, and nowcasts of storm location, height and intensity.

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Available online: http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-14-00173.1

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

Chapter 35. Extent of assessment of marine biological diversity
First Global Integrated Marine Assessment, World Ocean Assessment I.
P. Miloslavich, T. Webb, P. Snelgrove, E. Vanden Berghe, K. Kaschner, P. N. Halpin, R. R. Reeves, B. Lascelles, M. Tarzia, B. P. Wallace, N. Dulvy, C. A. Simpfendorfer, G. Schillinger, A. Boustany, **B. B. Collette (NMFS/OST/MED)**, J.E. Graves, D. Obura, M. Edwards, M. Clark, K. Stocks, T. Morato, V. Tunnicliffe, R. Hopcroft, P. Archambault, P. Pepin, J.W. Tunnell, Jr., Fabio Moretzsohn, Elva Escobar-Briones, Henn Ojaveer, J. Gobin, M. Nakaoka, K. Fujikura, H. Yamano, X. Li, K. Venkataraman, C. Raghunathan, C. L. Griffiths, N.J. Bax, A.J. Butler, A. Brandt, and H.J. Griffiths, and J. Rice

● Summary of extent of assessments of marine biological diversity

Publication date: January 2016

Chapter 36F. Open Ocean deep Sea

First Global Integrated Marine Assessment, World Ocean Assessment I

J. Ingalls, M. R. Clarke, **M. Vecchione (NMFS/OST/MED)**, J. A. A. Perez, L. A. Levin, I. G. Priede, T. Sutton, A. A. Rowdon, C. R. Smith, M. Yasuhara, A. K. Sweetman, T. Soltwedel, R. Santos, B. E. Narayanaswamy, H. R. Ruhl. K. Fujikura, L. A. Zettler, D. O. B. Jones, A. R. Gates, and P. Snelgrove, P. Bernal, and S. Van Gaever

● Conservation of deep-sea areas and areas beyond national jurisdiction.

Publication date: January 2016

Chapter 36G. Arctic Ocean

First Global Integrated Marine Assessment, World Ocean Assessment I.

L. L. Jørgensen, P. Archambault, C. Armstrong, A. Dolgov, E. Edinger, T. Gaston, J. Hildebrand, D. Piepenburg, W. Smith, C. Quillfeldt, **M. Vecchione (NMFS/OST/MED)**, and J. Rice

● Conservation of Arctic Ocean resources and areas beyond national jurisdiction.

Publication date: January 2016

Chapter 36H. Southern Ocean

First Global Integrated marine Assessment, World Ocean Assessment I.

V. Adler, M. Azzaro, R. Hucke-Gaete, R. Mosetti, L. Quartino, A. R. Rey, L. Schejter, **M. Vecchione (NMFS/OST/MED)**, and E. R. Marschoff

● Conservation of Antarctic resources and areas beyond national jurisdiction

Publication date: January 2016

Chapter 41. Tunas and Billfishes

First Global Integrated Marine Assessment, World Ocean Assessment I.

V. Restrepo, V., M. J. Juan-Jorda, **B. B. Collette (NMFS/OST/MED)**, F. L. Fredou, and A. Rosenberg.

● Conservation status of tuna and billfish populations.

Publication date: January 2016

Chapter 51. Biological communities on seamounts and other submarine features potentially threatened by disturbance

First Global Integrated Marine Assessment, World Ocean Assessment I.

J. A. Koslow, P. Auster, O. A. Bergstad, J. M. Roberts, A. Rogers, **M. Vecchione (NMFS/OST/MED)**, P. Harris, J. Rice, and P. Bernal

- Conservation of Deep-Sea and areas beyond national jurisdiction.

Publication date: January 2016